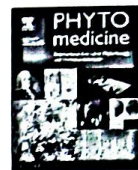


Udai Pratap Autonomous College, Varanasi



3.4.3 Proof of Paper Publications in Journals

Session: 2018-19



Intranasal curcumin regulates chronic asthma in mice by modulating NF- κ B activation and MAPK signaling

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ABSTRACT

Background: Curcumin, a natural product found in the plant *Curcuma longa*, has been reported to have diverse range of molecular targets that influence numerous biochemical and molecular cascades including anti-inflammatory and antioxidant properties.

Purpose: The aim of the study was to investigate the therapeutic potential of intranasal curcumin on ovalbumin (OVA)-induced chronic asthma and to elucidate underlying molecular mechanisms.

Study design/method: Mice were sensitized and exposed to 2% OVA aerosol for 2 times in a week for five consecutive weeks to study effect of intranasal curcumin on various MAPK pathway enzymes involved in chronic asthma and its effect on the activation of nuclear factor κ B (NF- κ B).

Results: Curcumin treatment decreased the ROS level in BALF and nitrite level in blood serum of chronic asthmatic mice. Curcumin treatment had significantly decreased the phosphorylation of JNK, ERK1/2, and p38 and COX-2 expression thereby nuclear factor κ B (NF- κ B) activation and expression in lung tissues.

Conclusion: These results suggest that intranasal curcumin protects against asthma via action on mitogen-activated protein kinase (MAPK)/NF- κ B signaling pathways.

Introduction

Chronic asthma has been considered as a disease characterized with many airway abnormalities including airway inflammation and remodeling. Airway abnormalities particularly the increased production of various cytokines, chemokines and growth factors, leads to the activation of intracellular signaling pathways. There are many pathways which are linked to signaling molecules and their crosstalk lead to the development of asthmatic disease. Studies suggest that there is an increased expression of multiple proteins in the respiratory tract, including pro-inflammatory proteins, cytokines, chemokines, and adhesion molecules. The time course and intensity of asthmatic responses by resident and circulating cells may be regulated by various inflammatory signaling, including Src family kinases (SFKs), protein kinase C (PKC), growth factor tyrosine kinase receptors, nicotinamide adenine

dinucleotide phosphate (NADPH)/reactive oxygen species (ROS), PI3K/Akt, MAPKs, nuclear factor- κ B (NF- κ B), activator protein-1 (AP-1), and other signaling molecules. These signaling molecules target proteins involved in airway inflammation as well as remodeling process (Lee and Yang, 2013).

The mitogen-activated protein kinase (MAPK) pathway is one of the major signal transduction pathways, which represent a converging point for many other signaling pathways, including tyrosine and serine/threonine kinases, G proteins, and calcium signaling. MAPKs regulate a variety of biological processes like cell growth and proliferation, chemotaxis, degranulation, and other secretory processes. Studies have implicated that the MAPK family of phosphoproteins are critical signaling molecules that leading to the generation of pro-inflammatory mediators. Airway remodeling is thought to be a consequence of long-term inflammation and MAPKs are key signaling molecules that drive pro-

Abbreviations: AP-1, Activator protein; BALF, Bronchoalveolar lavage fluid; Cox-2, Cyclooxygenase-2; cPLA2, Cytosolic phospholipase A2; DCFH-DA, Dichlorofluorescein diacetate; ERK 1/2, Extracellular signal-regulated kinase; GFTKR, Growth factor tyrosine kinase receptors; ICAM-1, Intercellular adhesion molecule-1; IL-1, Interleukin-1; JNK, Jun-N-terminal kinase 11.; Lox-5, Lipoxygenase-5; MMP-9, Matrix metalloproteinase-9; NADPH, Nicotinamide adenine dinucleotide phosphate; NO, Nitric oxide; NOS, Nitric oxide synthase; NF- κ B, Nuclear factor- κ B; OVA, Ovalbumin; p 38K, p38 kinases; MAPKs, Mitogen activated protein kinase; PKC, Protein kinase C; ROS, Reactive oxygen species; SFKs, Src family kinases; TNF- α , Tumor necrosis factor- α ; VCAM-1, Vascular cell adhesion molecule-1

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Synthesis and morphological study of Mn doped ZnS films

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Abstract

Low temperature chemical bath deposition (CBD) technique has been employed to synthesize Manganese (Mn) doped ZnS films. The synthesized material was systematically characterized by X-ray diffraction (XRD), scanning electron microscopy (SEM), energy dispersive X-ray spectroscopy (EDAX), Fourier transform infrared spectroscopy (FTIR), and photoluminescence (PL) techniques. XRD spectra revealed the existence of cubic zinc blende structure and nanocrystalline nature of synthesized material. PL spectra shows an intense band at 486 nm (2.55 eV), while the intensity of band obtained at lower energy region 375, 416 nm were decreased in the synthesized film, which indicate that incorporation of Mn decreased the surface defect in ZnS films. Surface structure of Mn doped ZnS nanoparticle was confirmed by FTIR. SEM images depicted the spherical shaped particles evenly distributed throughout the substrate. It was noticed that presence of Mn enhances the agglomeration process, resulting the larger sized particles.

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Keywords: Chemical bath deposition; Thin film, Manganese; ZnS; Photoluminescence,

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SHRUBS OF VARANASI CITY *CLERODENDRUM* L. (VERBENACEAE) WITH A NEW RECORD TO UTTAR PRADESH

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ABSTRACT : Four shrub species of *Clerodendrum* L. (*C.cordatum*, *C.indicum*, *C.inerme* and *C.phlomides*) occurring in city areas of Varanasi district, Uttar Pradesh have been described taxonomically in detail. *C.phlomides* is found as a new record for the state of Uttar Pradesh. A differentiation table along with photographs and analytical drawings of each species is provided.

Key words : *Clerodendrum phlomides*, New record, Taxonomy, Urban flora.

INTRODUCTION

An area of continuous urban development is called Urban area. It is believed that cities are drivers and responders to the environmental changes and reducing species diversity. Urban biodiversity has come under pressure in the last century because of urbanization and habitat destruction. Urban areas are now considered as an integral part of the urban ecosystems. According to Good (1989) urban greening and nature conservation within urban areas has grown into an important consideration for ecologists, naturalists and landscape designers since the early 1980s.

Varanasi, the present study area, is one of the ancient, continuously inhabited cities of the world and one of the most important Hindu pilgrimage sites. The area of Varanasi has been settled for millennia, and represents now a large urban environment. Despite this importance, very little information exists on the flora of Varanasi in general. Only few attempts have been made to record the Urban flora of Varanasi city in the past (Joshi & Reddy, 1969; Roy, 1971; Varshney, 1971; Gupta, 1979; Dubey, 2004; Verma *et al.*, 2007; Raman *et al.*, 2008; Singh *et al.*, 2008 and Singh, 2010, 2011, 2012, 2016). Keeping in view these facts, we are recording the occurrence, morphology and taxonomy of shrubs and trees in the city areas of Varanasi for the last one and half year. In the present study morpho-taxonomic attributes of four shrub species of *Clerodendrum* L. viz. *C.cordatum*, *C.indicum*, *C.inerme* and *C.phlomides* occurring in city area of Varanasi have been described in detail. Perusal of literature reveals that *C.phlomides* is a new record for the state of Uttar Pradesh (Khanna *et al.*, 1999).

MATERIAL AND METHODS

Varanasi city lies at latitudes 82°50' E to 83°03' E and longitude 25°10' N to 25°25' N at an altitude of approximately 79.1 m above the sea level, with fairly level topography. It has a humid subtropical climate with high variation between summer and winter temperatures. Summers are long, from early April till October, with the monsoon season in between. Cold waves from the Himalayan region dip temperatures across the city in the winter from December-February. The average temperature is 32°C-46°C in summer; 5°C-15°C in the winter. The average annual rainfall is 1110 mm. Fog is common in winter while hot dry winds called low blow in summer. Soils are generally old alluvial deposits of the middle Gangetic plain (Verma *et al.*, 2007).

During survey of urban areas of Varanasi district (25°10'-25°37' N & 82°11'-83°01' E, 80.19 m a.s.l.), U.P. The voucher specimens of reported taxa viz. *C.cordatum*, *C.indicum*, *C.inerme* and *C.phlomides* have been collected. The world distribution and identification of the collected specimens were ensured after going through related publications (Hooker, 1872-1897; Duthie, 1903-1929; Haines, 1925; Srivastava, 1976; Verma *et al.*, 1993; Rajendran & Daniel, 2002; Dubey, 2004 and Singh & Khanuja, 2006). Systematic details have been described after examining ten fresh collections from ten different localities and photographed with the help of digital Camera-Sony, α -200 (Fig.1). The differentiating taxonomic characters of the reported taxa have been provided in the Table.1. Voucher specimens have been preserved in our herbarium (Voucher numbers 12699, 12731, 12787 and 12788) for future reference.

RESULTS AND DISCUSSION

The genus *Clerodendrum* was described by Linnaeus (1753) with one species, *C.infortunatum*, the type of which came from India. It was placed in "Didynamia Angiospermia". In 1763, Adanson changed the latinised form of the genus, as originally published, to an all Greek form "*Klerodendron*" p. 12 or "*Clerodendron*" p. 199 as also used by most subsequent authors of the eighteenth, nineteenth and early twentieth century's. In 1805, Jaume Saint-Hilaire proposed the family Verbenaceae for *Clerodendrum* and other related genera, a concept accepted by subsequent botanists (Munir, 1989). He placed the



EVALUATION OF GENOTOXIC AND CYTOTOXIC EFFECTS OF BENDIOCARB IN BONE MARROW OF *CALOTES VERSICOLOR*

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ABSTRACT

In this study, genotoxic and cytotoxic effects of Bendiocarb were evaluated in the bone marrow of *Calotes versicolor*, a reptilian model, using chromosomal aberration assay, micronucleus assay and mitotic index. Adult male garden lizards were acclimatized for one week in the laboratory and then injected intraperitoneally with a daily dose of 5.3 mg/kg body weight (1/3rd LD50) of Bendiocarb. Frequencies of CA in the form of gaps increased significantly ($P \leq 0.005$) after 14th day of treatment. Breaks, deletions and additions were increased significantly ($P \leq 0.05$) after 21st day. MN frequencies increased significantly ($P \leq 0.05$) after 14th day. No significant change in frequencies of MI was observed till 14th day. However, after 21st day MI frequencies decreased significantly ($P \leq 0.05$) in the treated group. This study thus, reveals that bendiocarb induces genotoxicity and cytotoxicity in a time dependent manner in the bone marrow cells of *Calotes versicolor*. The study also reveals the sensitivity of CA, MN and MI as significant bioassay for genotoxicity and cytotoxicity assessment.

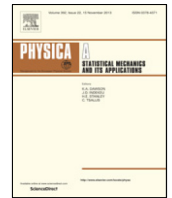
Keywords: Bendiocarb, Chromosomal aberration, Micronucleus, Mitotic Index, Reptile, *Calotes versicolor*.

INTRODUCTION

Reptiles are considered a globally declining taxon. Hypotheses for reptile decline include: habitat loss and degradation, invasive species, disease/parasitism, global climate change, and environmental pollution (Gibbons *et al.*, 2000). Pesticides are one of the main contaminants of concern to the terrestrial environment, and although data on the effects of pesticides in reptiles are scarce, some studies show detrimental effects on lizard species even at recommended dosage (Alexander *et al.*, 2002). Excessive use of insecticides may further lead to indirect consequences like diminished food availability or plant cover due to imbalance in the ecosystem. In addition, reptiles occupying higher trophic positions are at considerable risk of bioaccumulating and biomagnifying certain pesticides to levels equal to or greater than those described in birds and mammals (Hall and Henry 1992; Hopkins *et al.*, 2005). Such characteristics make them suitable for use as bioindicators of deleterious effect of various pesticides and they have often been used as valuable models for ecotoxicological studies and risk assessment both *in vivo* and *in vitro* (Matson *et al.*, 2009; Strunjak- Perovic *et al.*, 2010; Lambert, 2005). Reptiles have been shown as excellent models in studies on association between chemical or physical agents and genetic damage however, they remain to be the group of vertebrates less studied in genetic toxicology (Poletta *et al.*, 2013). Reports on carbamate induced genotoxicity in reptiles are meager, confusing and conflicting and there are no reports regarding the genotoxic effects of bendiocarb in *Calotes versicolor*. Hence interest aroused and male garden lizards *Calotes versicolor* were selected as model organism in this study with an aim to investigate the genotoxic and cytotoxic potentials of the carbamate insecticide, Bendiocarb on the bone marrow cells following chronic exposure, under laboratory conditions. Highly sensitive bioassay; the chromosomal aberration

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A reliable numerical algorithm for fractional advection–dispersion equation arising in contaminant transport through porous media



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HIGHLIGHTS

- We consider a fractional advection–dispersion equation.
- A reliable numerical approach is applied to examine the fractional problem.
- Convergence analysis of the proposed scheme is shown.
- Numerical examples are given to show the effectiveness of the numerical method.

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ABSTRACT

This article presents a reliable numerical approach for the fractional advection–dispersion equation by making use of Legendre scaling functions as a basis. The fractional advection–dispersion equation describes the anomalous transport in surface and subsurface water. Using two dimensional basis formed by Legendre scaling functions, we get operational matrix for fractional integrations and differentiations. Substituting these operational matrices in the equation leads linear algebraic equations whose solutions can be derived with the aid of Sylvester's approach; this in turn yields approximate solutions for advection–dispersion equation. Convergence analysis of the proposed scheme is presented. The potency and accuracy of the proposed numerical algorithm are shown by plotting error figures.

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1. Introduction

The advection–dispersion equation (ADE) has been generally utilized to interpret the mechanism of contaminants in the subsurface. It is an interesting differential equation in science and engineering, and a problem of considerable influence to perceive the transportation of chemical or biological contaminants via subsurface aquifer systems [1,2]. The transport and fate of solutes in soils and ground water have been a focal point of experimental as well as theoretical investigations in subsurface hydrology. In several real life situations, we require to anticipate the time nature of a contaminated ground water layer. It has also been employed to narrate the flow in porous medium [3], heat transfer through draining film [4],

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Determinant and Quantifying Producer Surplus of Paddy in Varanasi District

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ABSTRACT

This study aims to portray the producer surplus and determinants of paddy in the district of Varanasi by using 90 samples comprise of less than one hectare, one to two hectare and above two hectare with the help of analytical tool linear and Cobb-Douglas production function. Result reveals that yield per hectare of paddy decreases with increasing size of farm and Absolute quantity of sale decreases with the size of family. Forced sale (distress sale) is a common feature on all the size group of farms because positive difference between marketable and marketed surplus Volume of production on marketable surplus is positively significant at one percent On large size group these factors volume of production, estimated consumption and the size of household membership which are significant at one per cent, two per cent and five per cent levels respectively. Linear function is fit very well compared to Cobb-Douglas function.

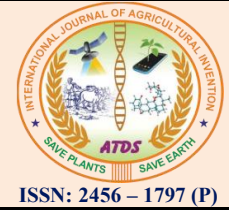
Key word: *Producer Surplus, determinant of marketable and marketed surplus, linear production function*

INTRODUCTION

Famous saying in Thirukkural written by Thiruvalluvar “they alone live who live by agriculture; all others lead a cringing dependent life” (couplet: 1033) statement clearly dictate the marketable surplus as the quantity sold out during the year and the quantity kept apart for later disposal. It is estimated by deducting from the total production, the genuine requirement of the cultivators family i.e. consumption, seed, feed and wages in kind payment to artisan, etc. while calculate should consider the stock of

pervious year left over. On the other hand, the marketed surplus was estimated as the quantity actually sold by the producers during the year reference. So that marketed surplus only the portion of the gross production which is actually marketed and is placed at the disposal of the non-producer by the producer. Marketable and marketable surplus plays an important role in the economy. Quantification and finding of factor determining these surpluses is more useful in the prediction of demand and supply of any food commodity.

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Utilization Pattern of Kisan Credit Card (KCC) in Baghpat district of Uttar Pradesh

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ABSTRACT

The Kisan Credit Card scheme introduced in the year 1998 with the objective of fulfillment of credit requirement of the farmers in hassle-free manner for raising agricultural production. There has been tremendous increase in number of Kisan Credit Cards in the rural areas during the last five years. Keeping the importance of KCC, the present study was an attempt to assess utility of KCC as perceived by the farmers. The present investigation was carried out in Baghpat district of Uttar Pradesh state with a sample of 120 farmers. The study revealed that the utilization of Kisan Credit Card (KCC) by the respondents was observed as maximum in the aspect *i.e.* increase in agricultural produce followed by increase in income, crop production activities, utilization of credit for vegetable production and allied activities and duration of utilizing credit. It was also found that Utilization of KCC was considerable low in the respect of the components as utilization for crop insurance, change in cropping pattern and diversified farming. The study suggests that Contingent planning for adverse climatic condition should be communicated to farmers well in advance. With a view to enhance the adoption of improved crop production technologies among the farmer's awareness and training programmes should be conducted in the regard.

KEYWORDS

Kisan Credit Card (KCC) Scheme, Cropping Pattern, Diversified Farming

HOW TO CITE THIS ARTICLE

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Agriculture is the most crucial sector of the country because the main policies of output growth, poverty alleviation, social justice and equity are best served in this sector. In modern farming, credit has become one of the crucial inputs. Thus, there is a need to increase the credit flow to agriculture, raise productive capacity of land and enhance the potential of water resources as well as its use efficiency for agricultural production. The Kisan Credit Card scheme introduced in the year 1998 with the objective of fulfillment of credit requirement of the farmers in hassle-free manner for raising agricultural production. The scheme is being implemented in the entire country by the credit institutional bank involving Commercial Banks, Rural Regional banks and Co-operative bank and

has received wide acceptability amongst bankers and farmers. It has also minimize the difficulties and to simplify the credit acquisition by small and marginal tribal farmers. It was disbursed through KCC Scheme in our country. There has been tremendous increase in number of Kisan Credit Cards in the rural areas during the last five years. Keeping the importance of KCC, The present study was an attempt to assess utility of KCC as perceived by the tribal farmers.

Objectives

- To assess the utilization pattern of Kisan Credit Cards of the farmers.
- To find out the constraints experienced by the farmers in utilization of Kisan Credit Cards.



Physico-Chemical Properties and Available N, P, K and S in Soils of Harahua Block of Varanasi district, Uttar Pradesh

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Soil is an important resource for production system but its productivity is declining day by day due to increasing degradation. The excessive use of fertilizers including agro-chemicals and water under monotonous cropping system to increase the food production, particularly in Indo-Gangetic Plain, resulted in detrimental effect on soil ecosystem (Jagdish Prasad 2004). To maintain the equilibrium in productivity *vis-à-vis* soil environment, it is necessary to periodically monitor the soil properties and nutrient availability. Soil testing provides information about nutrients availability in soil which forms the basis for the fertilizer recommendation for sustainable production (Doneriya *et al.* 2013). Present study was conducted to analyze the physico-chemical properties and nutrients in soils of an agriculturally important Harahua block of Varanasi district, Uttar Pradesh. Seventy five soils samples (0-15) were collected from Bhelkha (V1), Chamaon (V2), Koiran (V3), Bhawanipur (V4), Pissaur (V5), Daniyalpur (V6) and Ganeshpur (V7) villages of Harahua block of Varanasi district. Sorghum, pearl millet, maize, paddy, pigeon pea and green gram are major crops during *kharif*, while wheat, mustard, field pea, and potato are commonly grown in *rabi* season. Quartering technique was used for preparation of soil sample. The samples were air-dried and passed through 2 mm sieve for analysis. The soil pH and EC were determined with 1:2.5 soil water ratio. The soil samples were analyzed for sand silt and clay (Chopra and Kanwar 1999); organic carbon (Walkley and Black 1934); available N

(Subbiah and Asija 1956); available P (Olsen 1954); available K (Jackson 1973); available S (Hariram and Dwivedi 1994), bulk density, particle density and porosity following standard procedures. Porosity and nutrient index value (Ghosh and Hasan 1976, 1979 and 1980) were calculated by using the formulae.

$$\text{Porosity} = \left(100 - \frac{\text{BD}}{\text{PD}}\right) \times 100$$

Nutrient Index Value =

$$\left[(\% \text{ soils high in available estimates of a nutrient} \times 3) + (\% \text{ soils medium in available quantities} \times 2) + (\% \text{ soils low in available quantities} \times 1) \right] \div 100$$

The soil pH varied from 6.1 to 8.5 (Table 1). About 57 % samples were neutral (pH 6.6 to 7.3), 29 % samples were mildly alkaline (pH 7.4 to 7.8) and 13 % samples were moderately alkaline (pH 7.9 to 8.4). The electrical conductivity of the soils varied from 0.22-0.47 dS m⁻¹ and were found to be normal (EC < 1.0 dS m⁻¹). The sand, silt and clay content of the soils varied from 31.1-52.1 %, 18-30 % and 18-35.2 % with mean values of 43.8, 23.6 and 26.1, respectively, with standard deviations of 6.35, 4.53 and 5.58. Bulk density and particle density ranged from 1.21-1.47 Mg m⁻³ and 2.00 to 2.77 Mg m⁻³. The porosity of the soils ranged from 27 – 57 % with mean value of 46.8 % and standard deviation of 5.88. According to Muhr *et al.* (1965) rating, the organic carbon content ranged from 0.30 to 0.75 % with an average of 0.63 % and standard deviation of 0.09. About 9 % samples had organic carbon content below 0.50 % and 90 % samples were between 0.50 - 0.75 %.

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Effect of phosphatic fertilizer and PSB on growth and yield of mung bean (*Vigna radiate* L.) in inceptisol of Varanasi

Nitesh Kumar Singh and RP Singh

Abstract

A field experiment was conducted at research plot of Udai Pratap Autonomous College, Varanasi. (U.P.) to study the effect of Phosphatic Fertilizer and PSB on Growth and Yield of Mung Bean (*Vigna radiata* L.) and Fertility Status of Soil. The experiment entailed of three phosphorus levels (20, 30 and 40 kg P ha⁻¹), and two levels of seeds inoculation with PSB (un-inoculation and inoculation). Results shown that the increasing levels of phosphorus up to 40 kg P₂O₅ ha⁻¹ and inoculation of seed with PSB increased the growth and yield attributes of the plant. On the basis of result shown by the current experiment we can say that the net return of the crop is increased with increasing the levels of phosphorus and inoculation of seeds with PSB.

Keywords: Fertility status, nutrient uptake, seed inoculation, PSB, growth and yield attributes, net returns

Introduction

Mung bean (*Vigna radiata* L.) is one of the important short duration pulse crop. Historically, India has been largest producer and consumer of Mung bean. However, its true yield potential has not achieved owing to several constraints (Singh *et al.*, 2010) [1]. It is cultivated on loamy sand soils in western Indo-Gangetic plains. It responds to both macro and micro nutrients. It is the third important pulse crop in India, covering an area of 2.86 million hectares, accounting for 12 percent of the total acreage, but constitutes only 8 percent of the total pulse production of the country. In spite of its considerable genetic improvement, the yield potentials have not yet been exploited in totality as visualized by its average productivity as low as 4.68 q ha⁻¹ in India (Yadav *et al.*, 2014) [2]. Declining trends in area, production and yield of pulses are recorded in the Indo-Gangetic plains popularly known as pulses basket of India. Rice-wheat and rice based cropping systems have replaced to a large extent the traditional pulse crop area, driving them out towards marginal / sub-marginal lands. Balanced supply of plant nutrients is essential for its high productivity. Nutrient requirement is one of the major abiotic constraints limiting productivity of mung bean. The inbuilt mechanism of biological nitrogen fixation enables mung bean crop to meet 80-90% of their nitrogen requirements. Balanced nutrition is indispensable for achieving higher productivity. At the same time, in view of increasing nutrients demand there is immense need to exploit the alternate source of nutrients *viz.* organic materials and biofertilizers to sustain the productivity with more environment friendly nutrient management systems. The environmental issues and other hazards emerging out of the imbalanced use of nutrients should also be addressed properly. Phosphorus is an integral part of plant body and the second major nutrient limiting plant growth is generally deficient in most of the soils due to its ready fixation (Schachtman *et al.*, 1998) [3]. The increasing prices of phosphatic fertilizers have raised an alarming situation for the country. Another issue is the reactivity of phosphate anions which are immobilized by forming a complex with Al or Fe in acidic soils (Norrish and Rosser, 1983) [4] or Ca in calcareous soils (Sample *et al.*, 1980) [5]. Hence, the amount available to plants is usually a small proportion of the total. Stevenson (1986) [6] reported that about 80% of added P fertilizers precipitated due to metal ion complexes. It has also been guessed that amount of P-fixed if solubilized might be sufficient for the next century (Goldstein *et al.*, 1993) [7]. The fundamental mechanism for mineral phosphate solubilization is the production of organic acids and chelating oxo acids from sugars (Antoun and Kloepper, 2001 and Peix *et al.*, 2001) [8, 9]. Production of organic acids results in acidification of the microbial cell and its surroundings. Gluconic acid seems to be the most common acids of mineral phosphate solubilization (Maliha *et al.*, 2004) [10]. Nodule forming Rhizobium has also been recognized as a P-solubilizer (Halder *et al.*, 1991) [11].

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EFFECT OF FOLIAR APPLICATION OF BORON AT DIFFERENT STAGES OF CROP GROWTH ON NUTRIENT UTILIZATION AND YIELD OF RICE (*Oryza sativa* L.)

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ABSTRACT

A field experiment was conducted during *Kharif* season of 2016 on research plot of Udai Pratap (Autonomous) College, Varanasi (U.P.) to study the effect of foliar application of boron at different stages of crop growth on rice (*Oryza sativa* L.). The experimental soil was sandy loam having available nitrogen 144 kg ha⁻¹, available phosphorus 12.2 kg ha⁻¹, available potassium 165 kg ha⁻¹ and available (hot water extractable) boron 0.17 ppm. The experiment was carried out in randomized block design (RBD) with six treatments and three replications. Treatments were T₀= RDF, T₁= RDF + B @ 1.5% at TFG stages, T₂= RDF + B @ 1.5% at TF stages, T₃= RDF + B @ 1.5% at TG stages, T₄= RDF + B @ 2.0% at T stage, T₅= RDF + B @ 1.5% at FG stages (RDF=Recommended dose of fertilizers, T= Tillering; F= Flowering; G= Grain filling). Significantly highest grain (42.0 q ha⁻¹) and straw (94.87 q ha⁻¹), yield was recorded with two foliar sprays @ 1.5% boron at tillering and grain filling stage as compared to control or other treatments. The same treatment also registered maximum nutrient (N, P, K and B) uptake by plant and grain.

KEYWORDS: Boron, Foliar Application, Rice, Nutrient Utilization

Boron is, of all the micronutrients, the least understood. Boron is neither an enzyme constituent nor does it affect enzyme activities in the plant. Boron, however, is involved in or plays a major role in a number of plant functions, some of which are not clearly understood, (Cheng and Rerkasem; 1993, Dell and Huang; 1997, Rerkasem and Jamjod; 2004). The key role of boron in plants includes floral organs and flower male fertility, pollen tube growth and utilization of carbohydrates. Therefore, the unavailability of boron during grain setting period results in poor anther and pollen development and the grain thus formed is often without starch. In the field, sexual reproduction is often more affected by low boron and significant grain yield reductions may occur without visual symptoms expressed during vegetative growth. It is believed that B deficiency affects pollen development during the pollen mother cell stage which coincides with the booting stage. Boron has also helped to reduce disease severity in some crops because of the effect that B has on plant metabolism, cell membranes and cell wall structure.

Intensive cropping systems and the use of high yielding hybrids have resulted in depletion of soil micronutrients. Globally, B deficiency has been recognized as the second most important micronutrient constraint in crops. Boron is absorbed by plants as boric acid, which is easily leached in soils. Foliar nutrient sprays may be an effective way to correct boron deficiencies, which some times results in higher yields and crop quality. Advantages

of a foliar application compared to a soil application included rapid plant response, increased convenience and effective placement. Foliar sprays of boron is most useful when roots of plants are not able to absorb required amount of boron from soil due to the soil chemical and physical properties such as pH, organic matter, calcium carbonate, soil texture, soil moisture temperature, microbial action and losses from leaching.

Rice (*Oryza sativa* L.) is the most important food crop of India in term of area, production and consumer preference. India is the second largest producer and consumer of rice in the world. Rice production in India crossed the mark of 111.01 million tonnes (MT) in 2017-18 accounting for 23.3% of global production in that year. The productivity of rice has 3576 kg per hectare in 2017 - 18. But still very low as compared to other top rice growing countries.

Imbalanced fertilizer application under micronutrient (B) deficient condition is one of the major constraints for attaining higher productivity of rice in sandy loam soil. Keeping above information in view, it is of practical significance to study the role of boron in nutrient utilization and effect on growth and yield of rice.

MATERIALS AND METHODS

A field experiment was conducted during *Kharif* season of 2016 on research plot of Udai Pratap

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Effect of NPKS and Bio-Fertilizers on the Performance of Green Gram (*Vigna radiata* L.) and Soil Properties

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ABSTRACT

A field experiment was conducted during 2016-17 to evaluate the influence of integrated use of major nutrients and bio-fertilizers performance on green gram and properties of soil. The treatments were control (T₁), 100% NPKS (T₂), 50% NPKS (T₃), 150% NPKS (T₄), 50% NPKS + PSB + Rhizobium (T₅) and 100% NPKS + PSB + Rhizobium (T₆). Application of 100% NPKS along with bio-fertilizer significantly increased the growth and yield as well as soil fertility status as compared to chemical fertilizers alone. Significantly higher number of pod, plant height, leaves per plant, dry pod, grain and straw yield of green gram and soil properties in terms of organic carbon, available NPK and S were obtained with application of 100% NPKS + PSB + Rhizobium (T₆) in comparison to other treatments. Significantly higher NPKS uptake was also observed with application of 100% NPKS + PSB + Rhizobium (T₆). This experiment indicated the superiority of integration between chemical fertilizer and bio-fertilizer over chemical fertilizer alone at all level of fertility.

Keywords NPKS, green gram, bio-fertilizers, soil properties, nutrient uptake, growth, yield

Pulses in India have long been considered as the poor man's only source of protein. It is grown mostly in Asian region traditionally while its cultivation has spread to Africa and Americas relatively in recent time. More than 70% of world's green gram production comes from India. Total production of green gram 2015-16 is 1590 thousand tones. Maximum area under pulses producing state in India is MP (22%) and for total pulse production is also MP (27%). Per capita availability of pulses in India is 472gm per capita per day and 17.2kg per capita per year (Anonymous, 2017). Being a legume, it has the capacity to fix the atmospheric nitrogen (30-50kg ha⁻¹). After picking of pods, green gram plant may be used as green manure. Green gram provides quality green fodder to the cattle. Green gram contain 20-25% protein 62.6% of carbohydrates, 1.15% fat, 5.27% crude fibre, 3.32% ash besides rich in lysine (436mg/g). It is also rich in Ca, Fe, K and good source of vitamins such as thiamin, niacin and vitamin A. Green gram grown during kharif spring and summer season in north-India. The optimum temperature range for growth is between

27 °C and 30 °C. This means that the crop is usually grown during summer. Seed can be planted when the minimum temperature is above 15°C. Green gram bean is considered to be heat and drought tolerant. The basic concept of integrated nutrient management is the supply of the required plant nutrients for sustaining the desired crop productivity with minimum deleterious effect on soil health environment. Integrated nutrient management intended for four major goals to be achieved. These are to maintain soil productivity, to ensure sustainable productivity, to prevent degradation of the environment and to reduce expenditure on the cost of chemical fertilizers (Sharma *et al.*, 2004). Nutrient balance is the key component to increase crop yields. Excess and imbalanced use of nutrients has caused nutrient mining from the soil, deteriorated crop productivity and ultimately soil health. Replenishment of these nutrients through organic and combination with organic and inorganic has a direct impact on soil health and crop productivity. Organic manures provide a good substrate for the growth of microorganisms and maintain a favorable nutritional balance and soil physical properties (Chaudhary *et al.*, 2004). The organic acids produced during decomposition of organic waste can exchange with adsorbed P and increase its availability to plants. Application of FYM increased the activity of acid and alkaline phosphatase, phosphodiesterase, inorganic pyrophosphatase and dehydrogenase leading to faster hydrolysis of ester-bond P to plant available P (Dinesh *et al.*, 2003). Due to increase in the inputs of cost, the profit margin of the farmer from crop produce is narrowing day by day. With the aim of maintenance of soil fertility and plant nutrient supply to an optimum level for sustaining the desired crop productivity through optimization of benefit from organic plant nutrient sources, it becomes necessary to minimize the expenses on fertilizers and at the same time sustain the crop yield and soil productivity by adopting integrated nutrient management approach. This practice not only increases the crop yield, but also improves physical, chemical and biological properties of soil. The major objective of this study was to find out the effect of NPKS and bio-fertilizers on plant growth and soil properties under green gram.

MATERIALS AND METHODS

A field experiment was conducted in *zaid* season (2016-2017) at agricultural farm of Udai Pratap Autonomous College, Varanasi developed on alluvium deposited. The

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(RESEARCH PAPER IN AGRICULTURAL CHEMISTRY AND SOIL SCIENCE)

Abstract

A field experiment was conducted during winter (rabi) season of 2016–17 in the Research Farm of Udai Pratap College, Varanasi to evaluate the effect of conjunctive use of NPKZn and FYM on mustard growth and yield. The experiment was conducted in randomized block design with 3 replications. The treatments were control (T₁), 100% NPK + Zn (T₂), 100% NPK + FYM (10 t ha⁻¹) + Zn (T₃), 125% NPK + Zn (T₄), 150% NPK + Zn and 50% NPK + FYM (10 t ha⁻¹) + Zn (T₅). Application of 100% NPK + FYM (10 t ha⁻¹) + Zn (T₃) significantly increased the growth and yield as well as improved soil fertility status as compared to chemical fertilizers alone. Significantly higher plant height, effective branch plant⁻¹, Grain siliqua⁻¹, grain and straw yield, oil content and soil properties in terms of organic carbon, available NPK and S were obtained with application of 100% NPK + FYM (10 t ha⁻¹) + Zn (T₃) in comparison to other treatments. Significantly higher NPKS uptake was also observed with application of 100% NPK + FYM (10 t ha⁻¹) + Zn (T₃). Results of this field trial indicated the superiority of integration between chemical fertilizer and bio-fertilizer over chemical fertilizer alone at all level of fertility.

Keywords: NPKZn, Mustard, FYM, soil properties, nutrient uptake, growth, yield

Introduction

Mustard play important role in oilseed economy of India and ranks second in terms of area sown and production next to groundnut. The contribution of rapeseed-mustard to the total oilseed production in India is 26.0%. India is the third largest producer of rapeseed-mustard (Piri *et al.* 2011) occupying 5.79 million hectares area with 6.31 million tonnes production, but the average yield of rapeseed-mustard in India is only 1152 kg/ha due to the lack of optimum use of nutrients and improper management. It is the major source of income in rain fed area because of its low water requirement (80-240mm). Indian mustard (*Brassica juncea*) is predominantly cultivated in the states of Rajasthan, Uttar Pradesh, Haryana, Madhya Pradesh, and West Bengal which occupied 82.22% area and 85.32% production (2014-15), out of which about 46.0% of total production contributed by Rajasthan state alone. Nitrogen is one of the important plant nutrients and it invariably improves the vegetative growth which is manifested through better plant height, primary branches, secondary branches, siliqua plant⁻¹, dry matter production which ultimately leads to higher seed yield. Nitrogen also improves the quality of produce. However, by addition of fertilizer nitrogen dose beyond certain limits decrease the oil content, but protein content in seed has been reported to increase significantly. Phosphorus is also essential for plant growth, cell division, root growth and cell elongation, seed and fruit development and early ripening. It is a constituent of several organic compounds including oils and amino acids. P-Compounds such as ADP, ATP in fact, act as energy currency within the plants. Sensitivity of oilseed crops to phosphorus deficiency greatly varies. Potassium is also necessary for higher yield & good quality of the produce as well for high response of N & P. Zinc is really a miracle micronutrient for plant life. It is involved in most of plant metabolic functions like Zinc production of auxin. Zinc is a growth promoting substance that controls the development of the shoot. It also plays significant role in various enzymatic and physiological activities of the plant system. Farm yard manure (FYM) helps in maintaining soil sustainability in terms of nutrients supply capacity of soil. The increase in productivity of the crops might be attributed due to its essential role of all nutrients present in FYM for plant growth through its effect as a good source of soil organic matter which improves the physico-chemical and biological properties of soil. Application of FYM also increases cation exchange capacity and buffering capacity of soil which helps in keeping soil micro nutrients in available form through its chelating action as well as microbial activity in soil besides supplying macro and micro plant nutrients. Integrated use of N P K and FYM significantly improved the organic carbon and available NP K Zn contents over the chemical fertilizers alone.

Integrated nutrient management with 100% N P K +10 t FYM ha⁻¹ resulted in maximum yields and improved the soil fertility (Chesti *et al.* 2015). Keeping the above facts in view this experiment was conducted to study the effect of integrated use of N P K Zn and FYM on soil properties and performance of mustard (*Brassica juncea* L).

Materials and methods

A field experiment was conducted in rabi season (2016-2017) at research farm of Udai Pratap College, Varanasi. The alluvial soil of experimental site was sandy loam in texture. The initial physico-chemical properties of experimental soil were bulk density 1.62 g cm⁻³, particle density 2.65 g cm⁻³, pH (1:2.5) 8.70, EC 0.82 dSm⁻¹, organic carbon 0.58 %, available nitrogen 310.70 kg ha⁻¹, available phosphorus 16.31 kg ha⁻¹, available potassium 282.62 kg ha⁻¹ and available sulphur 11.37 kg ha⁻¹. The various treatments applied to mustard were control (T₁), 100% NPK + Zn (T₂), 100% NPK + FYM (10 t ha⁻¹) + Zn (T₃), 125% NPK + Zn (T₄), 150% NPK + Zn and 50% NPK + FYM (10 t ha⁻¹) + Zn (T₅). The treatments were triplicated in randomized block design (RBD). The recommended dose for mustard was 60 kg N ha⁻¹, 40 kg P₂O₅ ha⁻¹, 40 kg K₂O ha⁻¹ and 5.5 kg Zn ha⁻¹. These nutrients were supplied by applying urea, DAP, MOP and ZnSO₄, respectively. Full dose of phosphorus, potassium and half dose of nitrogen applied at the time of sowing, remaining half dose of nitrogen was applied as top dressing at 45 days after sowing (DAS) and Zinc (Zn) was applied at the rate of 5.5 kg ha⁻¹ in all plots through ZnSO₄ at the time of sowing. The FYM (farm yard manure) was applied as per treatment before 15 day of sowing. Soil samples from 0-15 cm depth were collected in plastic bag from individual plots at 30, 60 and 90 DAS. Soil sample of each plot was air-dried, processed to pass through 2 mm round hole sieve and analyzed for oxidizable organic carbon (1N K₂Cr₂O₇), available N (0.32% alkaline KMnO₄ oxidizable), P(0.5 M NaHCO₃ extractable), K (1 N neutral ammonium acetate extractable) and S (0.15% CaCl₂) following the methods described by Walkley and Black method (1934), Subbiah and Asija (1956), Olsen *et al.* (1954), Hanway and Heidel (1952) and Williams and Steinbergs (1959), respectively. Soil pH was determined in 2:1 soil: water suspension with the help of glass electrode in digital pH meter and electrical conductivity of soil was measured in the supernatant liquid of soil water suspension (1:2) by conductivity bridge (Jackson, 1973). Bulk density in undisturbed samples collected with metal cores of 4.2 cm diameter and 5.8 cm height was measured (Blake, 1965). Five plants were marked randomly in each replicated plot and height was measured from base of plant to the tip of the upper most latest leaf for calculating mean plant height at 30, 60 and 90 DAS. Numbers of effective branches were determined by counting Flower bearing



Biopesticides: A Key to Sustainable Agriculture

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ABSTRACT

Various forms of life have existed in this universe ever since it was created. Many of them vanished in the changing environment and those which could adapt, survived. Among millions of life forms existing in this world, one species - human has got power to alter this world. They are always in search of things which led them to adapt to this changing environment. When pest population was increasing and farm production declining, they searched for ways and means through which these pests could be controlled and thus the synthetic pesticides came into being. Human never thought about the detrimental effects of these pesticides and used them indiscriminately for getting higher production. Later various detrimental effects on soil, environment, human and whole ecology were realized and search for an alternative to synthetic pesticide began and finally biopesticides came into existence. Biopesticides are those pesticides which are extracted from natural or biological means. They are non-toxic in nature giving ecofriendly system for pest control. Ensuring food and nutritional security to ever increasing population of the world is a prime concern, especially when factor productivity is declining, environmental pollution is increasing and natural resources are as always limited. Sustainable agriculture in such situations seems to be viable option. Sustainable agriculture systems are those systems which are economically viable and provide nutritious and safe food with maintaining natural resources for present as well as for future generations. There are various tools followed for attaining sustainability in agricultural production system among which biopesticides is the one.

Key words: Sustainable agriculture, Biopesticides, Microbial pesticides, Semiochemicals.

INTRODUCTION

Agriculture is critically important for ensuring food security, alleviating poverty and conserving the vital natural resource on which the world's present and future generation will be entirely dependent upon for their survival and wellbeing. Before 19th century most food in the world was organically produced using

organic manure and human and animal power (horses in US and oxen in Asia)¹⁴. World population was 1.6 billion in 1900 which became 6 billion in 2000 and 6.8 at present. This rapid increase in the human population necessitated the use of modern technologies in agriculture production system.

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RESEARCH ARTICLE

Identification of restorers and maintainers lines in rice (*Oryza sativa* L.)

■ S.B. Verma

SUMMARY

Three cytoplasmic genetic male sterile (cm) lines, mainly IR 58025 A, PMS 8 A and PMS 10 A were crossed with eight indigenous rice genotypes of saline alkaline and scented high yielding to identify their prospective restorers, partial restorers and effective maintainers. Study of F_1^s enabled to identify fourteen restorers ten partial restorers to CMS lines. None of the lines were found to be partial maintainers and effective maintainers for the CMS lines.

Key Words : Rice, CMS lines, Restorers, Maintainers

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Rice is most important cereal crops of global significance. It belongs to family Poaceae (Gramineae) having chromosome no ($2n = 2x = 24$). The success of hybrid rice breeding programme mainly depends on the identification, development, maintenance and evaluation of CMS lines (A-lines) their maintainers (B – lines) and effective restorers (R-lines). The method developing hybrid with the use of A, B and R line is popularly known as “three line breeding” approach in China. The identification of restorers and maintainers of CMS line is done by crossing CMS lines with large number of genetic stock. The impressive growth of agricultural productivity that transformed a food deficit nation in to a self sufficient one is a major

accomplishment. The extensive adoption of the technological innovation of sixties in rice forming and rice based cropping system such as rice-wheat has been key to growth and stability of food grain production. India was too late in developing the adopting hybrid rice technology is spite of knowing its potential. When yield level of the high yielding varieties started stagnating at different levels even one tones advantage of the hybrid technology over the best varieties is by any standard sizable grain. Significantly hardly any alternative technology capable of given 10-15 per cent higher yield. The cytoplasmic male sterile source of Wild Abortive is being used extensively in China and India for development of hybrids (Lin and Yuan, 1980). The restorers and maintainers for Wild Abortive cytoplasm were reported earlier by Rangaswamy *et al.* (1987); Rosamma and Vijay Kumar (2005); Raju Ram *et al.* (2006); Sabar *et*

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RESEARCH ARTICLE

Analysis of combining ability for yield and its contributing traits in rice (*Oryza sativa* L.)

S.B. Verma

SUMMARY

Among the pollinator lines Swarna followed by NDRK 5026 were found to be good general combiners rest of the lines were poor combiners for grain yield and its major components. Among the CMS lines PMS 10 was found good general combiners for grain yield and its major components characters. Among 24 hybrids studied IR58025A x MT 20-1-1, PMs 8 A x NDRK 5023, IR 58025 A x NDRK 5026 exhibited high sea effects for grain yield, days to 50 per cent flowering, plant height, total no of tillers per plant, panicle bearing tillers per plant and panicle length. The magnitude of SCA variances than GCA variances for all characters were much higher. Maximum GCA and SCA variance was recorded for total spikelets per panicle and grain yield, respectively. Due to negative GCA variances for panicle length and test weight the average degree of dominance and predictability ratio could not be work out.

Key Words : GCA, SCA, Rice combining ability

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Rice (*Oryza sativa* L.) is the most important food crop of the world. Rice belongs to family poaceae (Gramineae) having chromosome number ($2n = 2x = 24$). The hybrid cultivar development their adoption are picking up very well in India. In rice so for cultivar has been using their own seeds of conventional varieties for several years without any replacement and the yields are satisfactory. However, the drawback associated with hybrid cultivar is that in next generation there is reduction in yield and also uniformity of grain and other characters

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due to inbreeding depression and segregation phenomenon operating in F_1 . In view of this fact many times the farmers are advised not to use the seed of F_1 crop next year for seed purpose of phenomenon of inbreeding depression and reduction of yield. Till the year 2005 about 785 million tonnes of paddy which is 70 per cent more than current production will be need for meet the growing requirement (Manomani and Khan, 2003). The combining ability analysis is the important and major tools to estimate the combining ability effects for selection of desirable parents in breeding programme.

MATERIAL AND METHODS

The present research work was undertaken to the

RESEARCH ARTICLE

Heterosis for yield components in rice (*Oryza sativa* L.)

S.B. VERMA

SUMMARY

Heterosis was estimated as per cent increase or decrease of F_1 values over either heterobeltiosis and over best variety Sarjoo 52. The relative magnitude of heterosis over better parent and standard variety has been studied for ten characters in twenty four hybrids. The nature and magnitude of heterosis differ from character to character depend upon hybrid combinations. Out of 24 F_1 fifteen and eleven hybrid exhibited significant positive heterosis over better parent and standard variety for grain yield. The cross IR 58025 A x NDRK 5026 (BP) and PMS 10 A x Swarna (SV) were best hybrids.

Key Words : Heterobeltiosis, Rice, Hybrid yield

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Rice is most important food crop of global importance. It belongs family gramineae having chromosome no ($2n = 2x = 24$). Development of more heterotic hybrid with good advantage exceeding 1.5 tonnes/ha, combining resistance to major pest and diseases and quality acceptable to different consumer section. Increase participation of private sector in hybrid breeding and seed production to promoted by favourable policy guidelines extending equal opportunity to public and private sector institution in respect of access to germ-plasm uniform treatment in testing and notification of private and public breed material and encouraging export hybrid seed.

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Presence of exploitable heterosis and sound seed production technique are important pre requisites for success of hybrid rice breeding programme. The genetic tools male sterile, maintainer and restorer lines essential to develop hybrid rice are available and it is only matter of time that parental lines adopted to different rice growing countries will be available (Virmani, 1986).

MATERIAL AND METHODS

The experimental material used for this investigation comprised of populations of 24 F_1 their parents 3 female and 8 male lines and one standard variety Sarjoo 52 was used. The F_1 hybrids and their parents were evaluated in Kharif season 1997 in the farm of Genetics and Plant Breeding Farm, NDUA and T, Kumarganj, Faizabad. The experiment was conducted in Randomized Block Design with 3 replication, each treatment had 4 rows of



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Genetic variability studies for yield and yield components in F₂ generation in rice (*Oryza sativa* L.)

Anoj Kumar Singh, Suresh BG, Anil Mahto, Ankit Kumar Singh, Shivendra Pratap Singh and Shyambabu Verma

Abstract

The present experiment was conducted at Field Experimentation Centre, Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture Technology and Sciences, Allahabad during *Kharif*- 2017 in Randomized Block Design (RBD) with three replications. The data were recorded for thirteen quantitative and seven quality characters to study genetic variability, heritability, genetic advance, correlation coefficient analysis and path analysis. Analysis of variance among 30 advance breeding lines in rice genotypes showed highly significant differences for all the characters indicated the presence of substantial amount of genetic variability. On the basis of mean performance highest grain yield per hill observed in genotypes SHUATS Dhan-211(ABL) (42.43 g), followed by SHUATS Dhan-224(ABL) (41.50), SHIATS DHAN-5 (40.68). High genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) was observed for flag leaf length (20.51 to 21.22), followed test weight (19.19 to 19.64), number of spikelet's per panicle (18.38 to 18.62) and number of panicles per hill, indicating that these characters could be used as selection for crop improvement. High estimates of heritability were observed for number of spikelets per panicle, days to 50 % flowering, test weight, flag leaf length, plant height and harvest index followed by seed yield per hill, biological yield per hill and number of panicles per hill. High genetic advance were for number of spikelets per panicle, plant height. Genetic advance as percent of mean was observed for test weight, number of spikelets per panicle, number of panicles per hill and plant height.

Keywords: Rice, Yield, Genetic variability, Heritability and Genetic advance

Introduction

Rice (*Oryza sativa* L.) is the most important staple cereal food crop in the world. Rice plays a vital role in Indian economy being the stable food for two third of the population. Rice is also called as the "Grain of Life" because it is not only the stable food for more than 70 per cent of the Indians but also a source of livelihood for about 120 million rural households. It accounts for about 43% of food grain production in the country. At the current rate population growth, which is 1.8%, rice requirement by 2020 would be around 140 million tones (Directorate of Rice Research, 2005) [4].

Cultivation of rice is important for the food security of Asia. India has a long history of rice cultivation. India stands first in area (43.97 m ha) and world's second largest producer (109.32 mt) of rice after china with the productivity of 2.55 tones per hectare. The year 2016-17 recorded the highest rice production (109.32 mt) still now. It is estimated that in India, the demand for rice will be 129.6 million tones by 2040 and 137.3 million tons by 2050 for internal consumption. Rice is the major crop in Uttar Pradesh and is grown in about 5.98 million hectares producing 14.63 million tones with the productivity of 2.44 tones per hectare. The cropping intensity is 153%. The state ranks 2nd in the country in production of rice. The low productivity in India is mainly due to its cultivation under rainfed situation in most of the rice growing areas. Arunachalam (1981) [2] reported that the greater chance of getting heterotic hybrids and enhanced variation in the segregating population of varietal improvement programmes. Germplasm is the core of any breeding work. Variability results due to difference either in the genetic constitution of the individuals of a population or in the environment in which they are grown. (Mohammad *et al.*, 2002) [8].

High heritable estimates are helpful in making selection of superior genotype on the basis of phenotypic performance of quantitative characters suggested that GCV, PCV, heritability and genetic advance will play an important role in exploiting future research projections of rice improvement. (Johnson *et al.*, 1955) [5]. Character exhibiting high heritability may not necessarily give high genetic advance. High heritability should be accompanied with high

Analysis of lifetime performance in Karan Fries Cattle

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ABSTRACT

Present investigation includes the study of the effect of genetic and non-genetic factors and estimation of genetic parameters with respect to lifetime production and reproduction traits of Karan Fries cattle. Data consisted of a total of 5878 lactation records on 1988 cows over a period of 32 years (1981 to 2012), maintained at ICAR-NDRI, Karnal. Overall least-squares means for LT2 (kg), LT3 (kg), LT4 (kg), LT5 (kg), ALTMY (kg), PL (days), HL (days), MY/PL (kg/day), MY/HL (kg/day), BE (%), LTDPR were found to be 7907.57±121.21, 12714.68±226.90, 17720.46±338.52, 22282.97±529.00, 15946.45±256.85, 1510.36±21.46, 2571.25±27.31, 9.87±0.11, 5.70±0.07, 89.30±0.84, 0.37±1.22, respectively. Both production and fertility lifetime traits were significantly affected by different factors viz. season of birth, period of birth, genetic group and normal lactations completed. LSANOVA heritability estimates of LT2, LT3, LT4, ALTMY, MY/PL, MY/HL, BE, LTDPR, PL and HL were 0.29±0.09, 0.30±0.12, 0.29±0.17, 0.17±0.08, 0.21±0.08, 0.27±0.09, 0.20±0.08, 0.09±0.10, 0.10±0.08 and 0.03±0.06, respectively. Heritability estimates indicated that lifetime fertility traits were less affected by additive gene action. Genetic correlation estimates indicated unfavourable positive correlation between lifetime fertility and production traits.

Key words: Fertility, Genetic parameters, Lifetime.

Abbreviations: LT2: Lifetime milk yield upto two lactations, LT3: Lifetime milk yield upto three lactations, LT4: Lifetime milk yield upto four lactations, LT5: Lifetime milk yield upto five lactations, ALTMY: Actual lifetime milk yield, PL: Productive life, HL: Herd life, MY/PL: Milk yield per day of productive life, MY/HL: Milk yield per day of productive life, BE: Breeding efficiency, LTDPR: lifetime daughter pregnancy rate.

INTRODUCTION

Productive life of dairy cattle in the herd is a function of both fertility and producing ability of the animal. Animals with higher productive life are bound to have a greater herd life and are highly economical for dairy farming. Selection of such animals in the herd is highly essential for success of a breeding programme; as such animals would not only be higher on the lifetime production but also a desirable calf crop can be obtained from them, which in turn would contribute towards positive genetic trend of milk production of the herd (Doyle *et al.*, 2000). Across the globe animal breeders have developed various strains of crossbred cattle and Karan Fries is one such strain of crossbred cattle it was developed as a result of crossbreeding project started in 1971, at N.D.R.I Karnal, wherein it was finally declared as a specific strain in 1982 (Gurnani *et al.*, 1986).

Literature regarding the performance appraisal of lifetime traits in Karan Fries cattle and factors affecting them are scanty, therefore the present investigation was undertaken to evaluate the performance of Karan Fries cattle with respect to lifetime traits and carry out the genetic analysis

for these traits; as such investigation would provide vital information regarding lifetime performance traits and highlight whether the present selection policy has had an positive effect on the lifetime performance.

MATERIALS AND METHODS

A total of 5878 lactation records on 1988 Karan Fries cows sired by 186 bulls, maintained at National Dairy Research Institute Karnal pertaining to the period between 1978 to 2012, were utilized for present study. Data were collected on fertility and production performance of Karan Fries cattle from history sheets and reproduction records maintained at record room, Dairy Cattle Breeding (DCB) division, Animal Breeding Research Centre (ABRC) and cattle yard.

For lifetime analysis records on the cows completing minimum of two normal lactations (i.e. greater than 100 days lactation length and greater than 500 kg milk yield per lactation) were considered for analysis. The lifetime performance appraisal of Karan Fries cows was done for the traits *Lifetime Milk Yield upto Two Lactations (LT2)* = Sum of milk yield of first two normal lactations of a cow.

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COMMON POISONOUS SNAKES OF INDIA - A REVIEW

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ABSTRACT

Among the creatures on Earth, snakes surely are the most widely feared and avoided. In India, particularly, they should be among the most widely respected and appreciated, because they do essential job of rodent control; so that the government introduced a ban on trade in snake skins. There are about 236 species of snakes in India, most of which are nonpoisonous. Their bites, apart from causing panic reaction and local injury, do not kill or even harm the patient. But 13 known species among them are poisonous and of these four, namely common cobra (*Naja naja*), common krait (*Bungarus caeruleus*), Russell's viper (*Dabiola russelii*) and saw-scaled viper (*Echis carinatus*) are highly

venomous and believed to be responsible for most of the poisonous bites in India. In the whole of India, with its near-1.2 billion population, of the approximately one million people bitten by snakes each year and only 1 in 20 dies. Even those figures don't represent the tangible threat, because a fair percentage of people die more from fear and conviction that they will die than from the venom itself. Bites from a venomous snake can produce a number of symptoms which includes swelling and localized pain and can become extended upto convulsions, vomiting, and even paralysis. First aid steps one can take after a snake bite occurs include cleaning the wound, not making any rapid body movement, remaining calm and immobilizing the affected area.

KEYWORDS: Bite, management, snake, venom.



Comparative study of ANN and conventional methods in forecasting first lactation milk yield in Murrah buffalo

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ABSTRACT

Present investigation was undertaken to predict first lactation 305-day milk yield (FL305DMY) using monthly test day milk records. Under this study, multiple linear regression (MLR) and artificial neural network (ANN) approach were used. Effectiveness of both methods was also compared for prediction of FL305DMY in Murrah buffalo. The data on 3336 monthly test day milk yields records of first lactation pertaining to 556 Murrah buffaloes maintained at National Dairy Research Institute, Karnal; Central Institute for research on buffalo; Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana and Choudhary Charan Singh Haryana Agricultural University (CCSHAU), Hisar were used in this study. In MLR study, it was observed that model 14 having four independent variable, i.e. FSP, TD2, TD4 and TD6 fulfilled most criteria such as highest R², lowest MSE, lowest RMSE, lowest CP, lowest MAE, lowest MAPE, and lowest U value. In the present investigation, the accuracy of prediction obtained from ANN was almost similar to MLR for prediction of FL305DMY using monthly test day milk records in Murrah buffalo. The best ANN algorithm achieved 76.8% accuracy of prediction for optimum model, whereas the MLR explained 76.9% of accuracy of prediction of FL305DMY in Murrah buffalo. MLR method is simple as compared to ANN, hence MLR method could be preferred.

Key words: AIC, ANN, BIC, FL305DMY, MLR, Test-day milk yield

The aim of any animal breeder is to evaluate sire in younger age to minimise the cost of rearing. Mostly 305-day milk yield is used for evaluation of dairy animals in India. Dairy cattle evaluation using test-day milk yields (TDMY) has significant advantages over the 305-day milk yield (Mostert *et al.* 2006). The use of TDMY permits a more precise understanding of contemporary groups and associated environmental effects. In developing countries like India, there is inadequate milk recording facilities, and use of test day models would result in reduced cost of recording as we could have longer intervals between milk recording and less frequent collection of milk samples. The multiple linear regression (MLR) models are being extensively used in various disciplines including dairy science to predict milk production of dairy animals. In recent times, Artificial Neural Network (ANN) is also used in some

areas of animal genetics and husbandry, such as to predict swine daily gain in different ambient temperatures (Korthals *et al.* 1994), estimating meat quality (Brethour 1994), prediction of 305 day milk production from part lactation records (Lacroix *et al.* 1995), prediction and classification of dairy cows based on milk yield in one period (Salehi *et al.* 1998), detection of clinical disease (Yang *et al.* 1999), evaluation of physiological status of cows (Molenda *et al.* 2001), detection of mastitis in dairy cattle (López-Benavide *et al.* 2003) and prediction of slaughter value of bulls (Adamczyk *et al.* 2005).

Present investigation was undertaken to predict FL305DMY on the basis of first lactation traits by MLR and ANN approach and to compare their effectiveness for prediction in Murrah buffalo. These methods could be used as a tool for recognition of more producer buffaloes of high genetic merit as the parents of the next generation.

MATERIALS AND METHODS

Source of data: The data on 3336 monthly test day milk yields records of first lactation pertaining to 556 Murrah buffaloes maintained at National Dairy Research Institute, Karnal; Central Institute for Research on Buffalo; Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana and Choudhary Charan Singh Haryana Agricultural University (CCSHAU), Hisar were

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The study on treatment of nitrogen and spacing with variety snowball

Archana Singh, Avanish Kumar Singh, DR Singh, RK Singh, Ankur Tomar, DK Singh and Sriom

Abstract

Field experiment regarding the effect of three levels of nitrogen control, lowest and highest dose per hectare which was supplied by means of urea and three levels of spacing that is 30cm, 45cm and 60cm each were carried out and cauliflower seedlings were transplanted in the field on 28 December 2013 at the Vegetable Farm of Udai Pratap Autonomous College, Varanasi. Nitrogen application had significant effect for all the characters at all the stages of the cauliflower plant. Highest dose of nitrogen per hectare had significant effect on the height of the plant, fresh and dry weight of leaves and fresh and dry weight of curd at different stages of period. Spacing had also a significant effect on height of the plants, fresh and dry weights of curd at 60cm. spacing distance each significantly effective in above trials.

Keywords: Nitrogen and spacing, variety snowball, minerals

Introduction

Vegetable are vital sources of minerals, vitamins and carbohydrate dietary which play an important role in human nutrition. Apart from nutrition, they also contain a wide array of potential photochemical like anti carcinogenic and antioxidant. India ranks second in the production of vegetables after China. The cauliflower belongs to the family cruciferae and chromosome no. 18 botanically known as *Brassica oleracea L. var. Botrytis* is one of the important vegetable crops of India and it grown for white tender head or curd formed by the shortened flower parts. The name cauliflower goes by the Latin name caulis which means cabbage and floris which means flower said to be the native of South Europe in the Mediterranean region (Thompson and Kelly, 1957.)^[9] The cauliflower is an important winter season vegetable crop in India. It originated in the island of Cyprus from where it moved to other areas like Syria, Turkey, Egypt, Italy, Spain and North Western Europe. (Boswell 1949). It was introduced to India in 1822 by a botanist James from Kew Garden, London. It is used as a vegetable in curries and soups, and making for pickles. It may be cooked alone or mixed potatoes. It contains a good amount of vitamins B and a fair amount of proteins. The nutritive value of cauliflower is given according to (Premnath, 1976): Per 100 g of edible cauliflower contain (Moisture 90.80, Mineral 1.9, Carbohydrate 4g, Potassium 113mg, Fat 0.4g, Phosphorus 57mg, Proteins 2.6g, Calcium 33mg, Calories 30, Iron 1.5, Vitamin A 51.1U, Vitamin C 56mg.). There is an urgent and stressing need to augment production of vegetables in India if we want to have a healthy nation. Looking at the importance of this crop and future prospects of this cultivar, present investigation namely. The spacing in cauliflower cultivation is to obtain better curd yield without adversely affecting the quality was carried out during the year 2012-2013 in agro – climatic condition of Varanasi district is hopes that results of these investigations might prove some importance towards successful cultivation of cauliflower.

Materials and Methods

Materials and methods adopted in this experiment are described below- Randomized Block Design of Layout was followed taking into consideration each treatment as an independent character. Three levels of nitrogen and three levels of spacing with snowball were adopted. The nitrogen and spacing were major importance.

Thus the altogether 27 plots were prepared to accommodate 3 replications of different treatments with necessary path irrigation channel. In the experiment of present investigation, the treatment of nitrogen is levels of Nitrogen, 0 kg, 150 kg, 200 kg nitrogen per hectare and spacing with variety snowball were as distance between rows 30 cm, 45 cm, 60 cm.



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Effect of NPK, vermicompost and spacing on growth, yield and quality of broccoli (*Brassica oleracea* L. var. *italica*)

Amit Kumar Singh, Dharmender Singh, NK Tiwari, Diwaker Singh and Lal Vijay Singh

Abstract

The experiment was conducted during winter season of during 2016-17 and 2017-18 at the Horticulture farm of Udai Pratap, Autonomous College, Varanasi (U.P.), is situated in the South eastern part of Varanasi city was carried out during winter season. The experimental material used for the "Effect of NPK, Vermicompost and Spacing on Growth, Yield and Quality of Broccoli (*Brassica oleracea* L. var. *italica*)" The materials used, experimental procedures followed and techniques of experimentation were planted at a spacing of 45cm x 45cm and 45cm x 60cm per plot under open conditions. The experiment was laid out in RBD comprising of Sixteen treatments with three replication study F₃ (180:80:80 NPK kg ha⁻¹) and minimum in F₁ (140:40:40 NPK kg ha⁻¹) and at 45 and 60 DAP the minimum plant height was recorded with F₄ (200:100:100 kg ha⁻¹) and minimum with F₁ (200:100:100 kg ha⁻¹) and minimum with F₁ (140:40:40 NPK kg ha⁻¹) during both the years of study. In case of spacing S₁ (45 x 45 cm) recorded maximum and minimum in S₂ (45 x 60 cm) at all the stages during both the years of experimentation. (T₁)- 140:40:40 NPK kg/ha + 45x45cm. Spacing + 20kgVermicompost/ha, (T₂)-140:40:40 NPK kg/ha + 45x45cm. Spacing + 10 kg PSB/ha, (T₃) -140:40:40 NPK kg/ha + 45x60cm. Spacing + 20 kg Vermicompost /ha (T₄)-140:40:40 NPK kg/ha + 45x60cm. Spacing + 10kgPSB/ha (T₅)-160:60:60 NPK kg/ha + 45x45cm. Spacing + 20kgVermicompost/ha, (T₆)-160:60:60 NPK kg/ha + 45x45cm. Spacing +10kg PSB/ha, (T₇)-160:60:60 NPK kg/ha + 45x60cm. Spacing + 20kgVermicompost/ha, (T₈) - 160:60:60 NPK kg/ha + 45x60cm. Spacing + 10kg PSB/ha (T₉) - 180:80:80 NPK kg/ha + 45x45cm. Spacing + 20 kg Vermicompost /ha (T₁₀) - V180:80:80 NPK kg/ha + 45x45cm. Spacing + 10kg PSB/ha (T₁₁) - 180:80:80 NPK kg/ha + 45x60cm. Spacing +20kgVermicompost/ha (T₁₂) - 180:80:80 NPK kg/ha + 45x60cm. Spacing + 10kg PSB/ha (T₁₃) - 200:100:100 NPK kg/ha + 45x45cm. Spacing + 20kgVermicompost/ha (T₁₄) - 200:100:100 NPK kg/ha + 45x45cm spacing + 10kg PSB/ha (T₁₅) - 200:100:100 NPK kg/ha + 45x60cm. Spacing + 20kg Vermicompost/ha (T₁₆) - 200:100:100 NPK kg /ha + 45x60cm spacing + 10 kg PSB/ha. The highest yield q ha⁻¹ was recorded in treatment F₄ (200:100:100 NPK kg ha⁻¹), while minimum in F₁ (140:40:40 NPK kg ha⁻¹). The biofertilizer such as PSB (B₂) @ 10 kg/ha which act positively with the above nitrogen dose which enhance significantly yield, weight of head, diameter of head, fresh weight of leaves and Vitamin C content in broccoli, non-significant but high performance of Vermicompost (B₁) @ 10 kg ha⁻¹ was seen in important quality characters such as protein content and Vitamin C. The application of 180:80:80 NPK kg ha⁻¹ + 45 x 45 cm. spacing + Phosphorus subulizing bacteria @ 10 kg ha⁻¹ in broccoli may be recommended in order to secure higher growth, yield and quality traits of broccoli.

Keywords: Vermicompost, broccoli, *Brassica oleracea* L

Introduction

Broccoli (*Brassica oleracea* var. *italica* L. sub var. *cymosa* cv. 'Premium crop') are belongs to family cruciferae, is a member of Cole group having 18 chromosomes (2n=18, x=9). The term 'Cole' originated from the word Colewort meaning wild cabbage. Application of vermicompost and poultry manure subsequently increase yield attributing characters and yield of broccoli (Sameera *et al.* 2005) [8]. Therefore, present investigation was carried out to find out the effect of organic manures on growth and yield of broccoli.

As per National Horticulture Database 2011, India is the largest producer of ginger and okra and ranks second in production of potato (10%), onion, cauliflower, brinjal and cabbage and is known as fruit and vegetable basket of the world. The overall growth rate of 2.08% in area, 1.64% in productivity and 3.72% in total production has been achieved during the last five years. Our demand of vegetables will be 225 million tonnes by 2020 and 350 million tonnes by 2030 (Singh, 2005) [9].

The present investigation was conducted at the Horticulture farm of Udai Pratap, Autonomous College, Varanasi (U.P.), is situated in the South eastern part of Varanasi city was carried out



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The response of cauliflower var. Snowball affected by different day stages level and spacing distances

Archana Singh, Avanish kumar Singh, Raj Shekhar, Rudra Pratap Singh and DK Singh

Abstract

The effect of spacing distance on the growth and yield of cauliflower (*Brassica oleracea* L.) was studied under the Agro climatic conditions of the Vegetable Research Farm of the Department of Horticulture, Faculty of Agriculture, UdaiPratap Autonomous College, at Varanasi (U.P.) during year (2012-2013). Varanasi is situated between 25° 15' North latitude and 60°03' East longitude. It has subtropical climate. The city is elevated about 129.23 meters above mean sea levels. Three spacing distance between rows (S₁=30cm, S₂=43cm, S₃=60cm) were used in this study. The avoidance of struggle for existence much depends upon placing the plants at proper distance so that they may get sufficient light and air for their proper growth and maintenance. Under this experiment, spacing 30, 45, 60 cm were given to the cauliflower plants to find out the most suitable distance at which they should be placed to grow well and yield the maximum the distance at which the least value of each growth characters was obtained, was taken as standard to compare with the values obtained with regards to the particular growth characters at other distance to find out the significant effect at placing. Thus the fresh weight of plant, fresh weight of leaves, dry weight of leaves and height of plant were found to have been significant effect at spacing 30 and 60 cm of the plant, spacing of 45 and 60 cm were found to have significant effect on fresh weight of plant, fresh and dry weight of leaves. Observation made at 20 days stage it was noted that spacing of 60 cm had significant effect on fresh weight of fresh and dry weight of leaves. At 40 days stage significant effect of 60 cm distance was observed on height of the plant, fresh weight of plant, fresh and dry weight of leaves. At 60 days stage significant effect at 60cm distance it was note that the height of the plant, fresh weight of plant, fresh weight of leaves and dries weight of leaves. At 80 days stage significant effect at 60cm distance was obtained on height of plant, fresh weight of plant, fresh weight of leaves and dry weight of leaves.

Keywords: Spacing, Climatic, Subtropical, Growth, Yield

Introduction

The cauliflower (*Brassica oleracea* var. *botrytis* L.) is an important winter season vegetable crop in India belongs to crucifer family generally termed as cole crops and consumed as raw or cooked. It was introduced into India from England by Dr. Jemson, Incharge of company bagh, Saharanpur, U.P in 1822 (Swarup & Chattarjee, 1972) the period of East- India Company. Cauliflower (*Brassica oleracea* L.) is grown for its white tender, head or curd formed by the shortened flower parts. Cauliflower thrives best in a cool moist climate. It does not withstand very low temperature or too much heat as well cabbage. Cauliflower heads will not develop well in hot weather, for this reason it is grown mostly the fall and winter. The optimum temperature where the cauliflower withstands is 10° to 15 °C. In regions where freezes does not occur, planting may be done at any time of the year if water is available for growing the crop. In regions where hard freezes occur well-hardened plants may be set out as early in the spring as the ground can be prepared or as soon as the danger of hard freezes is over. The increase in yield per acre is due to many factors but primarily due to better production practices resulting from specialization by growers. The average yield produced in Northern areas is far below than the yields produced in other parts of the country. This low yield may be due to the improper agronomic practices or use of improper mineral fertilizer to the crop.



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Vegetative growth, flowering behaviour and fruit development of green house cucumber cultivars (*Cucumis sativus* L.)

Surya Prakash, SK Chaubey, Sudhanshu Shekhar, VP Dwivedi and DK Singh

Abstract

The field experiment was conducted at Experimental Farm of Indian Institute of Vegetable Research, Varanasi, U.P. during two consecutive years 2007 and 2008 on growth, flowering behavior and fruit development of greenhouse cucumber (*Cucumis sativus* L.). The farm soil is sandy loam in texture having 6.6 to 7.4^{pH}. The experiment consisted 12 cucumber varieties such as, CH-20, Prasad-10, CH-24, Pusa Sanyog, SPP-44, NH-150, Patna, Rachi-3, Poin settle, Green long, Swarna Ageti and SPP-56 with 3 replication in randomized Block Design. Results showed that varieties Pusa Sanyog at 14th D.A.A. while, 28th, 42nd D.D.A. maximum fresh weight was associated with cultivar Ranchi-3 and dry weight was noted C.V. NH-150 at 28th D.A.A. than other rest varieties. Male flowers were earlier than female flowers in all the cultivars of cucumber in the both years. Prasad-10 is suitable for earlier flowering anthesis of flower on lower nodes. The fruit size of cucumber was maximum developed at initial stages *i.e.* from 7th to 14th and 21st days after anthesis of different cucumber varieties in study years.

Keywords: D.A.A.- days after anthesis, cucumber - cultivar

Introduction

Among the vegetables, cucurbit play an important role in human diet. They are known for their nutritional, medicinal and curative properties, especially being a low calories vegetable. In India cucurbits form an important and big group of vegetables crops cultivated extensively (Singh 2006) [4]. Cucumbers are produced around the world with the U.S. being the fourth largest producer, after china, India and Russia. In the India, cucumbers are produced in many states across the country with Haryana, Karnataka, M.P., Tamil Nadu, Andhra Pradesh, Telangana, Assam and Uttar Pradesh leading production. In India, cucumber is the most important vegetable crop occupying an area of 76 thousand hectares contributing an annual production of 1217 MT in 2017-18 (Anonymous, 2019) [6]. Cucumbers (*Cucumis sativus* L) is a most popular fruit vegetables of north and south India. It can be grown as well as lower, high hills and river bank of India. It belong cucurbitaceae family and play an important role in human diet. The tender green fruits of cucumber are used as salad, pickles, culinary purpose and known a super food in recent days. Now a day, it is widely used to manufactures various cosmetics items like face cream, face wash, shampoo etc. The cucumber peel contains caffeic acid and ascorbic acid for maintaining healthy skin, relieving irritation and reducing inflammation in human being. The cucumber is characterized by monoecious sex expression but andromonoecious, gynoeccious and trimonoecious forms are also found. The nature of plant is trailing or climbing with hairy, angular stems, leaves with three to five lobes and long petioles. Cucumber are often eaten as a vegetable but they are scientifically considered a fruit as they contain enclosed seeds and develop from a flower.

The optimum stage of harvest for good quality is not specified. It become imperative to underline the optimum stage of harvesting of fruits. Hence, the present investigation was done with the objective to select best cultivar in early production and flowering behavior in green house condition.

Material and Methods

The present investigation was carried out at Research Farm of Indian Institute of Vegetable Research, Varanasi, U.P. during the year 2007 and 2008.

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Genetic divergence of parental lines and their F₁ progeny in bottle gourd [*Lagenaria siceraria* (Mol.) Standl.]

Lal Vijay Singh, Diwaker Singh, Amit Kumar Singh, Dharmender Singh and NK Tiwari

Abstract

The experiment was conducted in Randomized Complete Block Design with three replications. In present investigation 54 genotypes (10 lines + 4 testers + 40 F₁'s) of bottle gourd were grouped into 8 distinct non overlapping clusters. This indicated presence of considerable diversity in the genotypes. The clusters contained genotypes of hetero genous origin. The genotypes of same geographic region were also found to be grouped together in the same clusters. Thus, there was no consistent relationship between genetic divergence and geographical distribution. Cluster I had maximum number of genotypes (23) followed by clusters VI (12), cluster III (10) and cluster VIII (5) while, rest of the four clusters contains mono genotypes. The intra cluster D² values ranged from 0.00 (cluster II, IV, V and VII) to 1088.31 (cluster VIII) while, the inter cluster diversity ranged from 142.37 (cluster IV and cluster IV) to 2849.61 (cluster IV and cluster VIII). The inter cluster distances between cluster IV to cluster VII (2849.61) and cluster V to cluster VIII (2838.87) were also very high. The higher inter cluster distance indicated greater genetic divergences between the genotypes of those clusters, while lower inter cluster values between the clusters suggested that the genotype of the cluster were not much genetically diverse from each other. Cluster III showed the maximum means values for vine length at last picking stage, number of primary branches per plant, fruit circumference, fruit weight, reducing sugar total sugars whereas, Cluster V showed high mean values for days to first fruit harvest, fruit circumference, fruit weight, fruit yield per plant. The results suggested that crosses between selected lines/F₁'s from widely separated clusters are most likely to give desirable recombinants/hybrids.

Keywords: genetic divergence, bottle gourd, D² analysis, cluster analysis

Introduction

Among the cultivated vegetables, cucurbits are associated with the origin of agriculture and dawn of civilization. Among food crops, cucurbits are largest producer of biological water, easily digestible and recommended even to sick and frail patients. Bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] is also known as white-flowered gourd and most important vegetables of ancient China. Because of hard mature rind of mature fruits, it is known as gourd. It is also commonly grown in Ethiopia, Africa, Central America and other warmer regions of the world. It is one of the important cucurbits in India, both as rainy and summer season vegetable. Out of the all cultivated cucurbits, bottle gourd with its high yield potential and adaptability to diverse climatic conditions holds a great promise to cope up with the per capita per day requirement of vegetables in the balanced diet (Singh, 1998) [1] of the fast growing population pressure and greater dietary awareness, particularly among the literate masses of a country like India. Bottle gourd was one of the first plant species to be domesticated for human use, providing food, medicine and a wide variety of utensils and musical instruments made from the large hard shelled mature fruits. A total of six species have been recognized belonging to the genus *Lagenaria*. Out of six species of *Lagenaria* only *Lagenaria siceraria* is the domesticated annual and monoecious in nature while the other five are wild congeners, perennial and dioecious (Bisognin, 2002) [2].

The tender fruits of bottle gourd can be used as a vegetable or for making sweets (e.g., *Halva*, *kheer*, *petha* and *burfi*), kofta and pickles. The fruit is rich in pectin also, which showed good prospects for jelly preparation. A decoction made from the leaf is a very good medicine for jaundice. The fruit has cooling effect, it is a cardi tonic and diuretic, good for people suffering from biliousness, indigestion and convalescences i.e., regain health after illness. The pulp is good for overcoming constipation, cough, night blindness and as an antidote against certain poisons. The plant extract is used as a cathartic and seeds are used in dropsy. In addition, the seeds and seed oil are edible.



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Effect of NPK, vermicompost and spacing on growth, yield and quality of broccoli (*Brassica oleracea* L. var. *italica*)

Amit Kumar Singh, Dharmender Singh, NK Tiwari, Diwaker Singh and Lal Vijay Singh

Abstract

The experiment was conducted during winter season of during 2016-17 and 2017-18 at the Horticulture farm of Udai Pratap, Autonomous College, Varanasi (U.P.), is situated in the South eastern part of Varanasi city was carried out during winter season. The experimental material used for the "Effect of NPK, Vermicompost and Spacing on Growth, Yield and Quality of Broccoli (*Brassica oleracea* L. var. *italica*)" The materials used, experimental procedures followed and techniques of experimentation were planted at a spacing of 45cm x 45cm and 45cm x 60cm per plot under open conditions. The experiment was laid out in RBD comprising of Sixteen treatments with three replication study F₃ (180:80:80 NPK kg ha⁻¹) and minimum in F₁ (140:40:40 NPK kg ha⁻¹) and at 45 and 60 DAP the minimum plant height was recorded with F₄ (200:100:100 kg ha⁻¹) and minimum with F₁ (200:100:100 kg ha⁻¹) and minimum with F₁ (140:40:40 NPK kg ha⁻¹) during both the years of study. In case of spacing S₁ (45 x 45 cm) recorded maximum and minimum in S₂ (45 x 60 cm) at all the stages during both the years of experimentation. (T₁)- 140:40:40 NPK kg/ha + 45x45cm. Spacing + 20kgVermicompost/ha, (T₂)-140:40:40 NPK kg/ha + 45x45cm. Spacing + 10 kg PSB/ha, (T₃) -140:40:40 NPK kg/ha + 45x60cm. Spacing + 20 kg Vermicompost /ha (T₄)-140:40:40 NPK kg/ha + 45x60cm. Spacing + 10kgPSB/ha (T₅)-160:60:60 NPK kg/ha + 45x45cm. Spacing + 20kgVermicompost/ha, (T₆)-160:60:60 NPK kg/ha + 45x45cm. Spacing +10kg PSB/ha, (T₇)-160:60:60 NPK kg/ha + 45x60cm. Spacing + 20kgVermicompost/ha, (T₈) - 160:60:60 NPK kg/ha + 45x60cm. Spacing + 10kg PSB/ha (T₉) - 180:80:80 NPK kg/ha + 45x45cm. Spacing + 20 kg Vermicompost /ha (T₁₀) - V180:80:80 NPK kg/ha + 45x45cm. Spacing + 10kg PSB/ha (T₁₁) - 180:80:80 NPK kg/ha + 45x60cm. Spacing +20kgVermicompost/ha (T₁₂) - 180:80:80 NPK kg/ha + 45x60cm. Spacing + 10kg PSB/ha (T₁₃) - 200:100:100 NPK kg/ha + 45x45cm. Spacing + 20kgVermicompost/ha (T₁₄) - 200:100:100 NPK kg/ha + 45x45cm spacing + 10kg PSB/ha (T₁₅) - 200:100:100 NPK kg/ha + 45x60cm. Spacing + 20kg Vermicompost/ha (T₁₆) - 200:100:100 NPK kg /ha + 45x60cm spacing + 10 kg PSB/ha. The highest yield q ha⁻¹ was recorded in treatment F₄ (200:100:100 NPK kg ha⁻¹), while minimum in F₁ (140:40:40 NPK kg ha⁻¹). The biofertilizer such as PSB (B₂) @ 10 kg/ha which act positively with the above nitrogen dose which enhance significantly yield, weight of head, diameter of head, fresh weight of leaves and Vitamin C content in broccoli, non-significant but high performance of Vermicompost (B₁) @ 10 kg ha⁻¹ was seen in important quality characters such as protein content and Vitamin C. The application of 180:80:80 NPK kg ha⁻¹ + 45 x 45 cm. spacing + Phosphorus subulblizing bacteria @ 10 kg ha⁻¹ in broccoli may be recommended in order to secure higher growth, yield and quality traits of broccoli.

Keywords: Vermicompost, broccoli, *Brassica oleracea* L

Introduction

Broccoli (*Brassica oleracea* var. *italica* L. sub var. *cymosa* cv. 'Premium crop') are belongs to family cruciferae, is a member of Cole group having 18 chromosomes (2n=18, x=9). The term 'Cole' originated from the word Colewort meaning wild cabbage. Application of vermicompost and poultry manure subsequently increase yield attributing characters and yield of broccoli (Sameera *et al.* 2005) [8]. Therefore, present investigation was carried out to find out the effect of organic manures on growth and yield of broccoli.

As per National Horticulture Database 2011, India is the largest producer of ginger and okra and ranks second in production of potato (10%), onion, cauliflower, brinjal and cabbage and is known as fruit and vegetable basket of the world. The overall growth rate of 2.08% in area, 1.64% in productivity and 3.72% in total production has been achieved during the last five years. Our demand of vegetables will be 225 million tonnes by 2020 and 350 million tonnes by 2030 (Singh, 2005) [9].

The present investigation was conducted at the Horticulture farm of Udai Pratap, Autonomous College, Varanasi (U.P.), is situated in the South eastern part of Varanasi city was carried out



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Genetic diversity in promising lines and their F₁ progeny of bottle gourd [*Lagenaria siceraria* (Mol.) Standl.]

Lal Vijay Singh, Diwaker Singh, Amit Kumar Singh, Dharmender Singh, and NK Tiwari

Abstract

The experiment was conducted in Randomized Block Design with three replications. In present investigation 54 genotypes (10 lines + 4 testers + 40 F₁'s) of bottle gourd were grouped into 8 distinct non over lapping clusters. This indicated presence of considerable diversity in the genotypes. The clusters contained genotypes of heterogenous origin. The genotypes of same geographic region were also found to be grouped together in the same clusters. Thus, there was no consistent relationship between genetic divergence and geographical distribution. Cluster III had maximum number of genotypes (29) followed by cluster I with nineteen genotypes, while rest of the six clusters contains mono genotypes. The intra cluster D² values ranged from 0.00 (cluster II, IV, V, VI, VII and VIII) to 573.59 (cluster III), while the inter cluster D² values ranged from 297.08 (cluster IV and V) to 3833.71 (cluster VII and VIII). The inter cluster distances between cluster VI to cluster VIII (3702.30) and cluster IV to cluster VIII (3321.49) were also very high. The higher inter cluster distance indicated greater genetic divergences between the genotypes of those clusters, while lower inter cluster values between the clusters suggested that the genotypes of the cluster were not much genetically diverse from each other. Cluster VI showed the maximum means values for days to first staminate flower anthesis, days to first pistillate flower anthesis, node number to first staminate flower, node number to first pistillate flower, days to first fruit harvest, vine length at last picking stage, fruit length and ascorbic acid whereas, cluster VII showed maximum mean values for fruit yield per plant and some other traits too. The results suggested that crosses between selected lines/F₁ from widely separated clusters are most likely to give desirable recombinants/hybrids.

Keywords: Bottle gourd, genetic divergence, d² analysis, cluster analysis

Introduction

Among the cultivated vegetables, cucurbits are associated with the origin of agriculture and dawn of civilization. Among food crops, cucurbits are largest producer of biological water, easily digestible and recommended even to sick and frail patients. Bottle gourd [*Lagenaria siceraria* (Mol.) Standl.] is also known as white-flowered gourd and most important vegetables of ancient China. Because of hard mature rind of mature fruits, it is known as gourd. It is also commonly grown in Ethiopia, Africa, Central America and other warmer regions of the world. It is one of the important cucurbits in India, both as rainy and summer season vegetable.

Out of the all cultivated cucurbits, bottle gourd with its high yield potential and adaptability to diverse climatic conditions holds a great promise to cope up with the per capita per day requirement of vegetables in the balanced diet (Singh, 1998) [1] of the fast growing population pressure and greater dietary awareness, particularly among the literate masses of a country like India. Bottle gourd was one of the first plant species to be domesticated for human use, providing food, medicine and a wide variety of utensils and musical instruments made from the large hard shelled mature fruits. A total of six species have been recognized belonging to the genus *Lagenaria*. Out of six species of *Lagenaria* only *Lagenaria siceraria* is domesticated annual and monoecious in nature while the other five are wild congeners, perennial and dioecious (Bisognin, 2002) [2].

The tender fruits of bottle gourd can be used as a vegetable or for making sweets (e.g., *Halva*, *kheer*, *petha* and *burfi*), kofta and pickles. The fruit is rich in pectin also, which showed good prospects for jelly preparation. A decoction made from the leaf is a very good medicine for jaundice. The fruit has cooling effect, it is a cardi tonic and diuretic, good for people suffering from biliousness, indigestion and convalescences i.e., regain health after illness. The pulp is good for overcoming constipation, cough, night blindness and as an antidote against certain

Research Article

Effect of Integrated Nutrient Management on growth and quality characters of Okra (*Abelmoschus esculentus* (L.) Moench cultivar Kashi Mohini (VRO-3)"

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Abstract

The experiment was comprised of 7 treatment combination including control. Four source of nutrients viz. FYM, NPK, *Azotobacter* and PSB was given alone or in combination in a Randomized Block Design with three replication in plots. FYM, *Azotobacter* and phosphate solubilizing bacteria (PSB) was applied as seed treatment before sowing. The observation on the number of nodes, internodes distance (cm), day taken to 50% flowering, number of fruit per plant, diameter of fresh fruit, length of fresh fruit (cm), average weight of fruit (gm), yield of fruit per hectare (quintal), T.S.S(%) and ascorbic acid (mg/100 g), were recorded at 90 days of sowing. The treatment (T₅) i.e. NPK(100:50:50 kg/ha)+PSB (7.5kg/ha), showed the significant superiority in giving, day taken to 50% flowering (60 days), number of fruit per plant (12.51), length of fresh fruit (21.15 cm), average weight of fresh fruit (13.79 gm), yield of fruit per plant (180.47 gm), yield of fruit per hectare (132.26 q/ha), T.S.S (8.82 %). The number of nodes per plant (17.83) and length of inter nodal distance (5.57 cm) was recorded under T₆ NPK (100:50:50 kg/ha)+*Azotobacter* (5 kg/ha) treatment, while the maximum diameter of fresh fruit (2.45 cm) and ascorbic acid (22.67mg/100g) was noted under T₆ NPK(100:50:50 kg/ha)+*Azotobacter* (5kg/ha)+PSB(7.5kg/ha) treatments. It can be concluded that the maximum growth and yield of Okra may be obtained by the application of NPK (100:50:50 kg/ha) + PSB(7.5kg/ha) in the treatment T₅ and NPK(100:50:50 kg/ha) *Azotobacter* (5kg/ha)+ PSB(7.5kg/ha) in the treatment T₆. Hence, both the treatments of Biofertilizer are recommended for the farmers for maximum Okra production.

Keywords: FYM, Biofertilizer, *Azotobacter****Correspondence**

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Introduction

Okra is herbaceous hairy annual plant widely cultivated in tropical and sub-tropical countries. It is now being considered as one of the most indispensable commodity for export and accounts for 60% of the total export of fresh vegetable excluding onion [1]. It tolerates high temperature during summer season and resistant to yellow vein mosaic virus under field conditions. Okra produces fruits for a longer period, therefore it requires excess and regular supply of nutrients for obtaining regular picking. Nitrogen, Phosphorous and potassium are the major nutrients and require in large quantities by plant for sustaining their life cycle and higher yield. Oxidized form of nitrogenous fertilizers cause hazard to human health and environment [2]. It is known that column of air over hectare of land contains eighty thousand tones of nitrogen but in fact this vast reserve of nitrogen could remain unutilized by crop until it is converted into available from either through industrial manufacturing or microbial fixation. Among these micro-organism *Azotobacter* have an important role to supplement nitrogen to the crop up to 20-30 kg/ha [3]. Phosphorous support in formation of fibrous roots which increases the capacity of absorbent nutrient from the soils neutralizes the harmful effect of nitrogen. Most of Indian soils are medium to Low in Phosphorus availability and require adequate Thus, VAM are gaining Popularity in these days, they make more nutrient available to plant and may reduce by 25-50 percent of the recommended dose of phosphorus. Mycorrhizal association helps in greater uptake of Phosphorus, zinc and copper [4]. Integration of chemical Fertilizers with organic manures is popular practice in reduction of application of chemical fertilizers. Beneficial effects of *Azotobacter* and VAM in crop production are well established. More interestingly, it was behold that joint inoculation of above bio-fertilizers can cause synergistic



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RESEARCH ARTICLE

GROWTH CHARACTERS OF MARIGOLD (*TAGETES ERECTA* L.) AS INFLUENCED BY INTEGRATED NUTRIENT MANAGEMENT

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ABSTRACT

The present investigation on periodical observations (30, 60 and 90 DAT) on vegetative growth AT c.s. Azad University of Agriculture and Technology, Kanpur during two consecutive years. The results displayed that all the growth parameters increased to the maximum up to the 75 % nitrogen level with or without biofertilizers. However, maximum plant height was attained with 100% N with or without any combination of biofertilizers. During the second year, effect of biofertilizers was more prominent and promising. As regard the flowering characters there was a significant reduction in days taken to first flower bud initiation and days taken to first flower bud opening under the combined application of bio fertilizers (*Azotobacter* + PSB) along with 75 % nitrogen in both the experimental years.

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INTRODUCTION

Marigold (*Tagetes erecta* L.), the most popular and commercial flower, apart from their aesthetic and industrial values, marigold is also equally important from the medicinal point of view, its leaf extract is a good remedy for earache, while its flower extract is considered as blood purifier, a cure for bleeding piles, eye disease, ulcers, wounds etc. (Arora, 1989). Marigold oil has a pronounced odour and acts as a repellent to flies. Marigold has got a wide range of application such as a trap crop and as a biopesticide in various horticultural and field crops. The main period for growing marigold in plains during winter season is from August to January. It is also grown in other seasons, like winter (November–April), summer (February–July) and rainy (May–October). As a result of continuous use of chemical fertilizers, the soil gets depleted year by year and there is pollution of soil and water bodies through leaching, volatilization, denitrification and fixation of phosphorous in soil. Nitrogen being highly mobile in soil can pollute soil and ground water, therefore, management of nitrogenous fertilizer such as rate, type of nitrogen fertilizer, application time is very important. Combination of *Azotobacter* + PSB + Phytoinocrem with 75% N was found

most effective in increasing the flower yield of marigold (Gupta et al., 1999). However, the detailed scientific information regarding up to what extent nitrogenous fertilizers can be reduced with the use of different bio-inoculants is not available. Thus, keeping in view the above facts, this experiment was undertaken.

MATERIALS AND METHODS

The present investigation was carried out on African marigold cv. "Pusa Narangi" in the Garden of the Department of Horticulture, Chandra Shekhar Azad university of Agriculture and Technology, Kanpur, U.P., during the winter season of two consecutive years i.e. 2008-09 and 2009-10. The experiment was carried out in sandy loam, well drained soil, having average fertility conditions. The soil samples were collected during October, November, January and February with the help of soil auger from different places of the experimental field at 0-15 cm depth, and were mixed together, air dried and were finally made into powder after proper grinding. The population of various types of the soil micro-organisms was enumerated by dilution planting method. A well rotten FYM @ 250 q ha⁻¹ was incorporated and mixed well in experimental plots, two weeks before the transplanting. Full dose of phosphorus and potassium was applied as basal dose in soil at the time of transplanting, with all the graded nitrogen treatments except control and AZB + PSB alone.

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RESEARCH ARTICLE

EFFECT OF COMBINATION OF PLANT NUTRIENTS ON FLOWERING AND YIELD OF MARIGOLD (*TAGETES ERECTA* L.)

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ABSTRACT

The present investigation was under taken during two consecutive years on periodical observations (30, 60 and 90 DAT) on vegetative growth at C.S. Azad University of Agriculture and Technology, Kanpur. Results indicated that all the growth parameters such as number of leaves, plant spread, diameter of plant stem, increased to the maximum upto the 75 % nitrogen level with or without biofertilizers. As regard the flowering characters there was a significant reduction in days taken to first flower bud initiation and days taken to first flower bud opening, under the combined application of biofertilizers (*Azotobacter* + PSB) along with 75 % nitrogen (T₈) in both the years. While, Application of 100 % nitrogen along with biofertilizer inoculation delayed both the parameters. However, the maximum days were required under control (T₁₄).

INTRODUCTION

Marigold is native of Central and South America, especially Mexico (Randhawa and Mukhopadhyaya, 1986). Marigold (*Tagetes erecta* L.), the most popular and commercial flower, apart from their aesthetic and industrial values, marigold is also got a wide range of application such as a trap crop and as a biopesticide in various horticultural and field crops. The main period for growing marigold in plains during winter season is from August to January. It is also grown in other seasons, like winter (November–April), summer (February–July) and rainy (May–October). As a result of continuous use of chemical fertilizers, the soil gets depleted year by year and there is pollution of soil and water bodies through leaching, volatilization, denitrification and fixation of phosphorous in soil. Nitrogen being highly mobile in soil can pollute soil and ground water, therefore, management of nitrogenous fertilizer such as rate, type of nitrogen fertilizer, application time is very important. Combination of *Azotobacter* + PSB + Phytoincremin with 75% N was found most effective in increasing the flower yield of marigold (Gupta et al., 1999). However, the detailed scientific information regarding up to what extent nitrogenous fertilizers can be reduced with the use of different bio-inoculants is not available.

Thus, keeping in view the above facts, this experiment was undertaken to obtaining higher and quality flower yield.

MATERIALS AND METHODS

The present investigation was carried out on African marigold cv. "Pusa Narangi" in the garden of the Department of Horticulture, Chandra Shekhar Azad university of Agriculture and Technology, Kanpur, U.P., during the winter season of two consecutive years i.e. 2008-09 and 2009-10. The twelve treatments was tested in three replicated trail under RBD. The experiment was carried out in sandy loam, well drained soil having average fertility conditions. The soil samples were collected during October, November, January and February with the help of soil auger from different places of the experimental field at 0-15 cm depth, and were mixed together, air dried and were finally made into powder after proper grinding. The population of various types of the soil micro-organisms was enumerated by dilution planting method. A well rotten FYM @ 250 q ha⁻¹ was incorporated and mixed well in experimental plots, two weeks before the transplanting. Full dose of phosphorus and potassium was applied as basal dose in soil at the time of transplanting, with all the graded nitrogen treatments except control and AZB + PSB alone. Nitrogen was applied in two splits first half (100 kg) at the time of transplanting and rest half (100kg) after 30 days of transplanting as top dressing.

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Review Article

Self-incompatibility a Mechanism for Controlled Pollination in Vegetable Crops

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ABSTRACT

Self-incompatibility is a widespread phenomenon in flowering plants that prevents inbreeding and promotes outcrossing. The response of self-incompatibility is genetically controlled by one or more multi-allelic loci, and relies on a series of complex cellular interactions between the self-incompatible pollen and pistil. It is a genetically controlled cell to cell recognition system that acts as a barrier to self-pollination in a wide range of vegetable crops like cabbage, cauliflower, tomato etc. Self-incompatibility is a major mechanism by which plants prevent self-fertilization and maintain genetic diversity. SI is estimated to occur in 30– 50% of flowering plant species. Several SI systems have now been identified. In all cases incompatible (self-) pollen is recognized by a highly specific genetically controlled mechanism that results in inhibition of the pollen in the stigma or style of the pistil. The use of SI in F₁ hybrid production has major advantage over other methods. Use of SI in cole crops for hybrid seed production is commercialised till date in vegetable crops because availability of cost effective mechanism/method to produce large-scale F₁seeds utilizing selected parental lines is an important factor, which ultimately determines the commercial viability of the hybrid varieties.

Keywords

Self-
incompatibility,
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Introduction

The mating system is one of the most fundamental characteristics of a plant species shaping population level processes such as inbreeding effects, demography (Morgan *et al.*, 2005), and evolutionary trends (Ferrer and Good, 2012). About 40%–60% of all species of flowering plants are thought to be self-incompatible (Igic *et al.*, 2008). Ever since the first discussion on

self-incompatibility by Darwin (1877), the phenomenon has extensively studied in several plant families and now significant amount of information is available on genes and gene products involved in the expression of SI trait (Dodds *et al.*, 1997).

Self-incompatibility (SI) is one of the most important systems used by many flowering

Original Research Article

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Responses of Ber (*Zizyphus mauritiana* Lamk.) Varieties to Different Level of Salinity

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ABSTRACT

Keywords

Ber, Cultivars, Leaf injury, Mineral composition, Salinity tolerance, Plant growth

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The current work aims to assess response of ber cultivars to different level of salinity. The salinity level (0, 4.0, 8.0, 12.0, 16.0 dSm⁻¹ ECe) had detrimental effects on growth and mineral composition of transplanted six ber cultivars. High levels of salts tolerated by most of the varieties but severely limit plant growth. High soil salinity decreased the growth (plant height, stem diameter, number of leaves per plant and dry matter yield) and mineral composition of leaves above conductivity of 12 dSm⁻¹ ECe. The Na⁺ and Cl⁻ content of leaves were increased with increasing the levels of salinity, whereas N, P, K⁺, Ca⁺⁺ and Mg⁺⁺ content was decreased. Specific injury due to high accumulation of chloride and sodium in the plant foliage of ber cultivars seemed to be the chief effect of salinity. On the basis of salt tolerance limits, ber cultivars Banarsi Karaka, Narendra Ber Sel.-2 and Ponda can be placed in tolerant and cvs. Narendra Ber Sel.-1 and Gola as semi-tolerant group. This result may help in commercial cultivation of ber in salt pretentious areas.

Introduction

Ber (*Zizyphus mauritiana* Lamk.) is a hardy fruit tree belongs to family Rhamnaceae with the chromosome number 2n = 48. It can be successfully grown in arid and semi-arid zones of Indian states particularly Haryana, Rajasthan, Madhya Pradesh and Gujarat. India has a rich source of underutilized native and exotic fruit trees, which may have a high agro industrial potential and represent an important economic source for the local populations and ber fruit is one of them. It is considered poor man's apple because its fruits are easily

available at low cost of production, rich source of vitamin C, protein and minerals (Pareek and Yahia, 2013). The cultivation of ber is gaining popularity in arid and semi-arid region in India because of its low maintenance cost, wide adaptability, low water requirement, high yield, good returns, scope for value addition and suitability even under wastelands (Martinuzzo, 2006). Ber is remunerative fruit, which can be grown successfully even in marginal and saline soils with little care. Due to its hardy nature, adaptability to marginal conditions of soil and climate and the nutritive value of its fruit, it has now become the most

Vermi products and biodegradable superabsorbent polymer improve physiological activities and leaf nutrient contents of gerbera

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Abstract

Consistent with the fact that limited water and nutrient availabilities adversely impact the growth of potted plants, we investigated the effects of vermi-products and Pusa Hydrogel on physio-biochemical relations of gerbera cv. Yosemite. The potting media having CPV (Cocopeat: Perlite: Vermiculite in 4:1:1 ratio) and the soils amended with vermicompost (VC), pusa hydrogel (PHG) and/or horn bio-manure (HBM) had significant positive effects on plant physiological parameters that greatly influence growth and flower yield. Amelioration of growing media with 20% VC, 0.25% PHG and 1.0% HBM and the application of 20% vermiwash (VW) proved superior over other treatments in terms of marked improvements in leaf chlorophyll content, gas exchange characteristics and mineral acquisition by gerbera plants.

In most of the cases, incremental additions of amendments and supplemental VW spray positively influenced these traits. Notably, 20% VW almost invariably proved superior over its lower (10%) concentration with regard to the parameters studied. Correlation study revealed that photosynthesis significantly increased with increase in stomatal conductance.

Similarly, plants having high relative water content in leaves also maintained higher chlorophyll levels. The beneficial effects of soil substitution and/or enrichment with different media seemed partly due to favourable changes in the physico-chemical properties of the growing media. It also appeared that conjunctive use of amendments and supplementary VW applications acted synergistically to enhance the plant performance. These findings lead to the conclusion that incorporation of vermi-products and superabsorbent polymers in conventionally used media may prove beneficial for gerbera plant growth and flower yield.

Keywords: *Gerbera jamesonii*, growing media, hydrogel, physiological parameters, vermicompost leachate.

Introduction

Gerbera (*Gerbera jamesonii* H. Bolus) is highly valued for its beautiful flowers characterized by their exquisite shape and size and attractive colours. When grown in pots, gerbera plants require frequent irrigation and nutrient inputs for optimum physiological functions and growth. It is due to this reason that a good potting media should retain water for longer duration of time so as to minimize the adverse impacts of water stress on plant growth. In drying soils, stomatal conductance decreases leading to restricted water uptake which then affects the plant growth.

Water stressed plants also exhibit the loss of photosynthetic pigments and decline in photosynthesis which account for reduced biomass production. Under limited water conditions, stomatal closure results in low CO₂ fixation and decreased availability of oxidized NADP⁺ as an electron acceptor for photosystem resulting in the accumulation of harmful reactive oxygen species detrimental to key biomolecules such as nucleic acids and lipids²⁶.

Fresh water shortages and relentless land degradation could cause heavy losses in agricultural production, especially in irrigated lands, in the foreseeable future. Different agronomic interventions including the adoption of drought tolerant cultivars and water saving irrigation techniques have been proposed to maintain the water balance under limited water supply conditions; especially in water stress sensitive crops such as gerbera where restricted water supplies may cause enormous losses in flower yield and quality²⁶. A number of amendments and conditioners enhance the plant growth by improving the soil properties and enhancing the water retention in the growing media¹⁴. Vermicompost (VC) containing worm castings and/or digested excretions is a soil conditioner used in both field and horticultural crops. It is rich in plant nutrients and improves the soil structure by enhancing its porosity, aeration and moisture holding capacity⁷.

Addition of VC to the growing media increases seed germination, growth, flowering and fruit production in a range of plants⁴. When used with vermiwash (VW), VC gives even better results probably due to synergistic action²⁷. It has also been implicated in reducing the physiological disorders, removal of pesticide residues and other undesirable substances harmful to soil health and



Short communication

Studies on extent of polyembryony in salt tolerant mango rootstocks

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ABSTRACT

The present study was undertaken to know the extent of polyembryony in three mango rootstocks, namely Olour, Kurukkan and 13-1. Freshly harvested seeds after 10 days were sown in earthen pots (sand: soil: FYM; 1:1:1). The number of seedlings from stones of Olour, Kurukkan and 13-1 were recorded and extent of polyembryony was calculated. The extent of polyembryony was maximum in Kurukkan (74.43%) followed by 13-1 (51.85%) and Olour (33.15%). The number of seedlings per stone ranged from 1 to 5 in Olour & Kurukkan; and 1 to 4 in 13-1 rootstock. The average number of seedlings per stone was maximum in Kurukkan (2.35) followed by 13-1 (1.88) and Olour (1.51).

Key words: *Mangifera indica*, polyembryony, rootstock.

Mango (*Mangifera indica* L.) is the most popular fruit in the tropical and subtropical regions of the world and in India too. India is the largest producer of mango in the world with an annual production of 18.43 mt from an area of 2.52 mha, contributing 20.70% share in total fruit production with the productivity of 7.30 t/ha (Anonymous, 1). Mango cultivation is mainly hampered by non-availability of uniform standard rootstocks. Mango can be propagated by seeds or by grafting. For commercial purpose, grafting is the most appropriate method because it maintains the genetic purity of the propagated variety. To obtain grafted mango, it is important to use polyembryonic rootstocks since they produce a zygotic and several nucellar plantlets. The additional embryos do not always mature and their growth may be arrested at very early stage or may degenerate during seed development.

Therefore, percentage of polyembryony would be far less than its actual frequency if mature seeds are taken into account. In Horticulture, nucellar adventives polyembryony is of great importance. The nucellar embryos provide uniform seedlings of the parental type as obtained through vegetative propagation. Nucellar seedlings of mango, citrus provide better clones of orchard rootstock than cuttings. The experiment was conducted at the main orchard of the Division of Fruits and Horticultural Technology, ICAR-IARI, New Delhi during 2012-2013. Mature open-pollinated fruits were harvested from single Olour, Kurukkan and 13-1 polyembryonic mother plants maintained mango germplasm block. Stones of 13-1 and mother plant leaves were collected from Horticulture Farm of M/s Reliance Industries, Jamnagar, Gujarat. Stone of all the three polyembryonic mango genotypes were germinated

in pots (sand: soil: FYM, 1:1:1). Observations on stone germination and emergence of seedlings were recorded. Stone having multiple seedlings emergence were selected and the data was analysed statistically. All the seedling arising from a single stone were tagged.

Analysis of data pooled over years clearly revealed that in Olour 75.10% stones germinated. Out of which 33.15% stones produced more than two seedlings per stone. However, 16.30% stones produced only two seedlings, 15.76% stones produced three seedlings and only 0.54% stones produced four to five seedlings. It was interesting to note that 66.84% stones produced only one seedling. The extent of polyembryony was in Olour 33.15% (Tables 1 & 2). Analysis of data pooled over years clearly revealed that in Kurukkan 81.09% stones germinated. Out of which 74.43% were polyembryonic having more than two seedlings per stone. However, 28.57% stones produced two seedlings and 33.08% produced three seedlings. Remaining, 10.52% stones produced four seedlings and 2.25% stones produced five seedlings per stone. It was interesting to note that 25.56% stones produced only one seedling. The extent of polyembryony in Kurukkan was 74.43% (Tables 1 & 2).

In 13-1 rootstock, 27% stones germinated. Out of which 51.85% stones produced more than two seedlings per stone. However, 18.51% stones produced two seedlings, while 29.62% stones produced three seedlings per stone. Remaining, 3.70% stones produced four seedlings per stone. It was interesting to note that 48.14% stones produced only one seedling. The extent of polyembryony was 51.85% in rootstock 13-1 (Tables 1 & 2). In our investigation, maximum germination was observed in Kurukkan (81.09%) followed by Olour (75.10%) and minimum in 13-1 (27%). Similar results were observed by Srivastava *et al.* (7).

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Review Article

Self-incompatibility a Mechanism for Controlled Pollination in Vegetable Crops

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Shilpa Kumari⁴ and Rimpi Debbarma⁵

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ABSTRACT

Self-incompatibility is a widespread phenomenon in flowering plants that prevents inbreeding and promotes outcrossing. The response of self-incompatibility is genetically controlled by one or more multi-allelic loci, and relies on a series of complex cellular interactions between the self-incompatible pollen and pistil. It is a genetically controlled cell to cell recognition system that acts as a barrier to self-pollination in a wide range of vegetable crops like cabbage, cauliflower, tomato etc. Self-incompatibility is a major mechanism by which plants prevent self-fertilization and maintain genetic diversity. SI is estimated to occur in 30– 50% of flowering plant species. Several SI systems have now been identified. In all cases incompatible (self-) pollen is recognized by a highly specific genetically controlled mechanism that results in inhibition of the pollen in the stigma or style of the pistil. The use of SI in F₁ hybrid production has major advantage over other methods. Use of SI in cole crops for hybrid seed production is commercialised till date in vegetable crops because availability of cost effective mechanism/method to produce large-scale F₁seeds utilizing selected parental lines is an important factor, which ultimately determines the commercial viability of the hybrid varieties.

Keywords

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Introduction

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self-incompatibility by Darwin (1877), the phenomenon has extensively studied in several plant families and now significant amount of information is available on genes and gene products involved in the expression of SI trait (Dodds *et al.*, 1997).

Self-incompatibility (SI) is one of the most important systems used by many flowering

UNFOLDING E-COMMERCE IN INDIA

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Abstract

E-commerce is growing very fast; it has been going up every year. Global electronic retail sales are expected to reach 8.8% of the total spends by 2018 from 8.2% in 2017. This is approximately \$2,197 trillion in year 2017 and \$2,489 trillion in year 2018. However, there are still lots of potential and untapped opportunities for the electronic businesses to grow their sales revenue and profit base. There are many challenges too that are distressing the movement of products and expansion to new markets.

E-commerce is exchange of goods and service through the medium of internet. In this research we attempt to find Stimulators that are fuelling growth of e-commerce sector in India. Ecommerce is the most growing business in India consisting huge market potential for investments. There has been huge flow of investment during previous year and more is projected in coming years. The rapid growth in use of smart phone and internet users has unfolded e-commerce industry in both rural and urban areas.

KEY WORDS: E-commerce, Stimulators, Big Data, Convenience, Mobile Internet Penetration, Annual Consumption Pattern and unfolded.

INTRODUCTION:

The E-Commerce market has realized unmatched growth since last year, it is anticipated that E-commerce will become more than \$20 million by the end of year 2018. With amplified use of smart phones, tablets and internet; e-commerce has become extensively accessible to both rural and urban consumers. Overseas corporations are investing huge capital into Indian firms. Expert global players are taking concern in Indian companies. E-commerce is growing also in rural areas with most of the movement coming from type-2 and type-3 cities. In July 2014 USA based Amazon invested \$2 billion in India, subsequently the news of Flipkart raising \$1 billion funds comes out. In India There are many big companies in e-commerce market like Snapdeal, Flipkart, Ebay, Amazon, Shopelues, TATA Clues and Jabong etc. Presence of large numbers of companies in market; resulted increase in competition to capture majority of the market share to increase their market size. The retail sector have registered annual growth of around 50%, huge investments is estimated to flow into associated logistics sector in near future. Many offline companies are gradually moving to online business and those who failed to do till now will be forced to choose online business. The e-commerce industry is in budding stage, more e-commerce companies are desirous to join the competition in future. Therefore consumer is benefitted and

there is high pressure to deliver best value to the consumers.

The E-commerce sector in India has exploded very recently, with many new segments being identified by niche players, among which the Foodtech is the most nascent niche. Still India has to move a long way with respect to e-commerce although the growth has been really rapid. Definitely the world's fastest growing large Indian economy will be benefitted with the growth of e-commerce

The growth of e-commerce is remarkable in Indian perspective, conventionally India has considered a cash oriented economy with unorganized offline retail stores driving purchases by the customers. Statistics shows that, now India is adding 6 million new consumers to the e-commerce industry, every month. This scale of growth is unmatched in any other market and witnessing the huge potential of the Indian e-commerce market.

E-COMMERCE

E-Commerce is buying and selling of products and services or transferring of funds or data, through an electronic network, primarily the internet. These transactions happen either business to business (b2b), business to consumer (b2c), consumer to business (c2b) and consumer to consumer (c2c). E-Commerce is executed using shopping carts, applications EDI, email; Digital commerce makes possible for purchasing transaction through the web and supports

Social Entrepreneurship at Bottom of the Pyramid

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1. INTRODUCTION OF BOTTOM OF PYRAMID (BOP)

At the top most of the world economic pyramid are 75 to 100 million prosperous Tier 1 people from around the world (shown in Figure 1.) This is a multinational group composed of higher middle and upper income people in developed nations and the few rich elites from the developing nations. In the mid of the pyramid, in Tiers 2 & 3, are poor people in developed nations and the growing middle classes in developing nations, the main targets of MNCs' previous emerging-market strategies. Now let us consider the more than 4 billion people in Tier 4, at the bottom of the pyramid (BOP). Their annual per capita income based on purchasing power parity in U.S. dollars is less than \$1,500, the lowest considered essential to sustain a decent life. For well above a billion people approximately 17% of humanity, per capita income is even less than \$1 per day. Even more substantial, the income gap between rich and poor is rising. According to the United Nations, the top 20 percent in the world accounted for more than 70 percent of total income in 1960. In 2000, that figure reached 85%. At the same time, the fraction of income accumulating to the poorest 20% in the world drop from 2.3 % to 1.1 %. This dangerous inequity of wealth distribution strengthens the view that the deprived cannot participate in the global market economy, even although they constitute the majority of the population. In fact, given its immense size, Tier 4 represents a multitrillion-dollar bazaar. According to World Bank predictions, the population at the bottom of the pyramid could be more than 6 billion over the next 35-40 years, because the majority of the world's population growth happens there.

The opinion that the bottom of the pyramid is not a worthwhile market also miss the mark to take into account the growing importance of the informal economy among the poorest of the poor, which by certain estimates accounts for 40 to 60 % of all economic action in developing nations. Most Tier 4 people live in rural communities, or urban slums and shantytowns, and they generally do not carry legal title or deed to their belongings (e.g., houses, farms, businesses). They have little or no formal schooling and are hard to reach via conservative distribution, credit, and communications. The quality and quantity of goods and services offered in Tier 4 is generally low. Therefore, like an iceberg with only its tip in plain vision, this enormous segment of the global population along with its immense market opportunities has remained generally invisible to the corporate sector.

Auspiciously, the Tier 4 market is wide exposed for technological innovation. Among the many opportunities for innovation, MNCs can be leaders in advancing to products that don't recurrence the environmental faults of developed nations over the past 50 years. Today's MNCs developed in an era of ample natural resources and thus inclined to make goods and services that were resource intensive and extremely polluting. The United States' approximately 270 million people only about 4% of the world's population consume more than 25% of the earth's energy resources. To reconstruct those types of consumption outlines in developing nations would be disastrous.

Microfinance: A Tool for Poverty Alleviation

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ABSTRACT

Past decades witnessed micro finance as a powerful tool to help low income group people residing below or just above the poverty line. But till today from its emergence this sector is an organized sector with low outreach according to requirement and potential. However government of India with NABARD and Self Help Groups played an active role in its growth and progress. But then there are certain issues and challenges which need an attention by new government. This paper discovers the prevailing gap in functioning of MFIs such as practices in credit delivery, lack of product diversification, customer overlapping and duplications, consumption and individual loan demand with lack of mitigation measures, less thrust on enterprise loans, collection of savings/loans and highest interest rate existing in micro finance sector. All these are clear syndromes, which tell us that the situation is moving without any direction. Finally paper concludes with practicable suggestions to overcome the issues and challenges associated with microfinance in India.

Keywords: Microfinance SHGs MFIs NABARD.

INTRODUCTION

Government of India has taken various steps for alleviating poverty since independence. However, in spite of the various efforts, almost 27 percent of total population in India still continues to be below the poverty line. It is identified that most of the poor are in the rural areas. Further, along with this poverty scenario, no adequate employment has been generated in the labour market in India. This may be one of the reasons for the persistence of poverty. Poor adopt various coping strategies to surmount their poverty situation. Credit, Asset Selling and Migration are some of the popular coping strategies adopted by the poor in India. Development Economists have over the years proposed that credit is one of the best strategies to overcome the problem of poverty. Credit can help the poor in taking up income generation activities which will in turn improve their standard of living. Microfinance is considered to be revolutionary because it aims at servicing the poorest of the poor, who were up till now considered unfit for financing of any kind except charity. Microfinance is one of the products of new developmental thinking and policy-making. It is a unique amalgamation of industrial (including financial) and institutional reforms in the present scenario of development economics.

Micro Finance may be defined as "provision of thrift, credit and other financial services and products of very small amounts to the poor in rural, semi urban or urban areas, for enabling them to raise their income levels and improve living standards". At present, a large part of micro finance activity is confined to credit only. Women constitute a vast majority of users of micro-credit and savings services.

This paper provides a brief overview of some of the important issues and challenges currently facing the microfinance institutions (MFIs) in India and finally concludes with practicable suggestions to overcome the issues and challenges associated with microfinance in India.

OBJECTIVES OF THE STUDY

In India so many micro lending institutions are working. Some are in very good condition in terms of lending, training to their clients for saving and small level entrepreneurship. Some are in bad condition and struggling for their existence. The present study is conducted to know the following things related to MFIs in India.

Status of Women Empowerment: Empirical Study of Uttar Pradesh

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Abstract

Women Empowerment is a strategy in which women challenge the existing norms and tradition, to effectively promote their wellbeing. The participation of women in Self-Help Group (SHGs) made a significant impact on their empowerment in both social and economic aspects. This study addresses women empowerment through SHGs in Uttar Pradesh.

Keywords: Women Empowerment, Self-Help Groups (SHGs) & Uttar Pradesh.

1.0 INTRODUCTION

India is the second most populated country in the world after China, where 70% of the total population lives in rural areas and most of them are poor. The weaker section of the society is out of the reach of formal financial institutions for their need of finance. Therefore, need was felt for some alternative policies, systems, procedures, methods, strategy for an easy access of financial services to poor people, which resulted into the formation of informal financial institution i.e. "Microfinance" by Professor "Mohammad Yunus". The growing social awareness across the world has brought the number of issues, to which gender biasness and lack of women empowerment are significant. Women don't have equal status to that of men because of social tribulations i.e. violence against women, illiteracy, poverty, stumpy health position, lack of active involvement in family as well as in society, financial reliance on men, social backwardness (in regards with rules, regulation, custom, tradition of the society) etc. continue to be great concern for them. Discernment against women should be reduced by empowering them in every aspects of lifespan. Mahatma Gandhi states that the position of women in the society is an index of its civilization. "Train a man and you train an individual, Train a woman and you build a nation". Empowerment of women includes economic opportunity, property rights, political representation, social equality, personal rights, right to education, active participation in family, decision making and personality development and so on. This could be achieved through "Self Help Groups" which is one of the best strategies of microfinance for the empowerment of women thereby reducing the gender biasness in the society. Poor and marginalized people lack facilities at individual level; thereby they organize themselves into a group for mutual and self- help called Self Help Group or in-short SHGs, which is now a well-known concept. SHGs model dominates microfinance in India. The principle of SHGs based on three words i.e. "by the people, of the people and for the people". It reveals the real participation of people's in the process of development at micro level. It's a small deliberate association of deprived people, preferably from the same socio-economic backgrounds for some common interest and benefits. Generally Self-Help Group consists of 15-20 members either women or men but not the mixed group.

1.1 REVIEW OF LITERATURE

Jitendra Ahirrao (2009) has analyzed the role of National Agricultural Bank for Rural Development (NABARD) in working as a catalyst in promoting and linking SHGs to the banking system. He has observed that majority of the rural women who are associated with the SHG activity positively succeeded to gain them empowered. He has concluded that micro-finance programmes being promoted as a key strategy for addressing both poverty alleviation and women's empowerment. Pandey, Jatin and Rini Roberts (2011) and he concluded that the SHG could be effective only when ensuring the proactive involvement of the women with the changes in the social norms. Ramakrishna, et al (2013) studies is based on secondary data

Factors affecting constituents of agriculture: A case study of Una district Himachal Pradesh

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Abstract The main objectives of this study are to evaluate the factor affecting constituents of agriculture and interrelationship between affecting factor constituent of agriculture in the study area. The physical and cultural constituents of agriculture development are most formidable. The climate, soil and relief are main physical constituents, which effect the agriculture development. The cultural constituents such as land tenure system, fragmented of holdings and operational are holding found of the study area. The Soil conservation need to highlight in the study area with large scale plantation, bench terraces augmented fertility of soils etc. The cultural constituents like bad tenure system and fragmented of holding should also be removed.

Keywords Constituents, Agriculture development, Holdings, Fragmentation, Operational, Land tenure

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Application of Size-Biased Geometric Distribution to Migration Data

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Abstract: Many mathematical and probabilistic models have been used in social sciences to explain the observed phenomenon in a summarizing form. In migration studies, it was observed that in the area under study all the households are not equally exposed to the risk of migration at a particular point of time and having at least one migrant. The present study shows the application of size biased geometric distribution to describe the observed phenomenon related to number of migrants and it was found that the models describes the phenomenon satisfactorily well.

Keywords: Rural out migration, size biased geometric distribution, chi-square

1 Introduction

Aggregate variation in population with connection to various social demographic and spatial characteristics based on data from districts, states and nation as a whole is called migration. The study of migration taken at community, village, household or individual level is done under micro level studies and it is based on objective and availability of data. In a developing country like India, where still about seventy per cent population lives in villages, migration from rural to urban or rural to rural areas has become a major concern of interest for demographers and social scientists as well as for policy makers.

Generally migration from rural areas is classified in three categories. In first category those household were kept from where only adult males migrate leaving their family in villages. Second kind of households was those from where adult male members migrate with their wives and children. The third kind household was mixture of the above two. The study of migration from rural areas at micro level has been conducted keeping in mind the above classification.

Many mathematical and probabilistic models have been used in social sciences to explain the observed phenomenon in a summarizing form. A model can explain the pattern, trend and volume of the demographic factors and thus is of great importance in study. Many stochastic models have been proposed and modified by the researchers to study the migration process. Different types of models have been proposed for migration studies based on the type of migration discussed above. The distribution of adult male migrants in a household has been explained by negative binomial distribution. After this a number of modifications and new models have been proposed to study the pattern of rural out migration (Hossain, 2000; Singh, 1984; Singh et.al, 2014, 2015, 2016; Sharma, 1988; Yadava and Singh, 1983). Later on several attempts have been made to explain the distribution households according to the total number of migrants based on assumptions (Yadava et. al, 1989, 1994; Pandey, 1993).

Most of the researchers had used the moment method as well as the mle method to estimate the parameters of the models. Some of the researchers had also used the method of mean zero frequently method (equating observed and theoretical zeros cell frequencies and means).

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Improved estimators for population mean in presence of measurement error

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Abstract

This paper proposed some improved class of estimators of population mean in presence of measurement error using auxiliary variable based on arithmetic mean, geometric mean and harmonic mean of the usual unbiased estimator, Salabh estimator (1977) and estimators due to Bahal and Tuteja (1991) in case of simple random sampling without replacement (SRSWOR). The expressions of bias and MSEs have been obtained up to the first order of approximation. The performances of the proposed estimators are checked using real population data set. In addition, an empirical study is carried out in the support of theoretical results.

Keywords: Auxiliary information, auxiliary variable, measurement error, bias, mean square error

1. Introduction

In survey sampling, generally it is assumed that the observations have been recorded without any error. Such a supposition may not be tenable in actual practice and the data may contain observational or measurement errors. Measurement errors can occur due to many factors such as due to interviewer, due to respondent or due to the instrument etc. Measurement error is generally taken as a difference between estimated value and true value or deviation of measured values from their true values. Several authors have paid their attention towards the estimation of population parameters such as mean, median, variance a coefficient of variation etc. in the presence of measurement error.

Shalabh (1997) ^[11] considered the estimation of population mean using ratio method and analyzed its properties in the presence of measurement error. The problem of measurement error has also been studied by Dubey and Singh (2001) ^[9] etc.

The objective of this paper is to suggest an improved exponential ratio type estimator of population mean of the study variable using information of auxiliary variable in the presence of measurement error.

2. Notations

Let us consider a finite population $W = (W_1, W_2, \dots, W_N)$ of N units out of which a sample of size n is drawn using simple random sampling without replacement (SRSWOR). Let Y and X be study and auxiliary variable respectively. Further assuming that X_i and Y_i are observed values for the i^{th} sampling units with measurement error as opposed to their true values X_i and Y_i on two characteristics X and Y respectively for the i^{th} ($i=1,2,\dots,n$) unit in the sample of size n . The measurement errors are defined as

$$u_i = y_i - Y_i \quad (2.1)$$

And

$$v_i = x_i - X_i \quad (2.2)$$

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A regression model approach to study the rural out migration

Raj Kumar Yadav and Upendra Kumar

Abstract

Migration process is affected by a large number of socio economic factors like age, sex, education, occupation, marital status, economic status etc. as well as the role of social status or family attachment, characteristics of area, household and individuals. The aim of present study is to study the effect of some socio-economic variables on current migration status and to evaluate the effect of recent past prior migrants along with some other variables on current migration. An attempt has been made to find out the factors responsible for migration decision process at village level with the help of multiple regression models. We have limited the present study to ten variables which are more significant. F-ratio's have been calculated to test the goodness of fit. Findings reveal that out migration is highly related to the past prior migration. The study shows that the pattern of out migration from the studied area is well explained by multiple regression models modified by taking prior migrants and other variables as independent.

Keywords: Prior migrants, F-ratio, multiple regression

Introduction

Migration is a complex phenomenon which involves social, economic, political and psychological factors. With industrialization, development and the changing pattern of population, all the efforts to cope with the social, cultural, economic, political and demographic problems have been proved futile before the rising population of a country. Thus in recent years, planners, social scientists and researchers are highly concerned with economic and social development of nations and recognize great importance to the ways and means of tackling the complex problem of population. The inter-relationship between population and development has been widely recognized as a vital input for formulating policies for economic development and population control. Since economic, social and political development of a nation is linked directly with the size and the pattern of growth of its population, it requires a thorough study and analysis of the factors, having a direct bearing on high rate of population increase as well as in depth understanding of the population distribution.

In the process of regional and economic development, urbanization and industrialization, migration has long been recognized as an important tool for redistribution of population either by performing it in a well defined manner or allowed to have its own course through spontaneous movement (Singh *et al.* 2015; Yadava *et al.*, 1989) [3, 4]. A household, especially in Indian context is a basic socio-economic unit for the integrated rural development. Household characteristics (age, size, occupation, socio-economic status, etc.) play a vital role in decision of its members to move or not to move. A study of movement process at the household level is also useful for the prediction of future size of the households as well as to study the imbalances in sex-ratio occurred due to such migration (Aryal 2002; Singh *et al.*, 2014, 2016; Yadava *et al.* 1991; 2002) [5, 6, 1, 8, 7].

Apart from above discussed factors, the role of social status or family attachment, characteristics of the area, household and the individuals have also played an important role for migration decision process. Thus there is a relationship between various demographic, social-psychological and economic factors in explaining the propensity to migrate an individual (Cadwall, 1968) [9]. Different models and techniques have been evolved to study the effect of various factors associated with migratory flows from rural areas. One of these models is models is multiple regression analysis which enables exploratory analysis of the significance



Effects of malathion on growth, biochemical composition and some enzymes of *Nostoc ellipsosporum* NDUPC002

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Abstract

Effects of malathion on growth, biochemical composition and some enzymes of *Nostoc ellipsosporum* NDUPC002 was studied. The cyanobacterial strain was isolated from agricultural fields of Varanasi, India. The strain was characterized by morphological as well molecular means. The organism was deposited at NAIMCC (NBAIM), Mau, India (Accession No. NAIMCC-C-000122). 5ppm, 10ppm, and 15ppm were concentrations of malathion treatments, and 10ppm was LC₅₀ value. All treatments of malathion inhibited the growth of cyanobacteria, and maximum inhibition was observed in 15ppm treatment. Chl.-a was induced (12.33%) in 5ppm treatment and decreased in other two treatments with the maximum reduction of 15.41% in 15ppm treatment. Total protein and carbohydrate content was slightly induced with maximum induction of 5.72% and 8.08%, respectively in 10ppm treatment. Nitrate reductase (NR) activity was induced in 5ppm (12.47%) and reduced in other two treatments with maximum inhibition of 46.56% in 15ppm treatment. The activity of glutamine synthetase (GS) increased in 5ppm treatment (10.74%) and decreased in other two treatments with maximum inhibition of 32.29% in 15ppm treatment. The finding of experiment suggested that 10 ppm (LC₅₀) and above conc. of malathion was inhibiting the growth, biochemical composition and some of the nitrogen metabolism enzymes (NR and GS) of *Nostoc ellipsosporum* NDUPC002.

Key words: Cyanobacteria, Malathion, *Nostoc ellipsosporum* NDUPC002

Introduction

Cyanobacteria are the prokaryote, Gram-negative and oxygenic phototrophs (Wilmotte, 1994). They have a wide distribution and are ubiquitous in occurrence (Henson et al., 2004) including extreme habitats of the world (Schulz and Scherer, 1999). Role of cyanobacteria in soil fertility is well established. Paddy fields are one of the most favorable natural niches for the growth and proliferation of cyanobacteria (Whitton, 2000) where they play a major role in primary productivity as well as the nitrogen economy of that ecosystem. Cyanobacterial growth and diversity are mainly governed by soil physicochemical properties. They prefer a natural to alkaline p^H for optimum growth. Many cyanobacteria fix nitrogen and comprise one of the largest global suppliers of fixed nitrogen in flooded/irrigated rice fields (Singh,1961; Roger,1996). Many nitrogen-fixing strains of cyanobacteria have been isolated and used in biofertilizer consortia in South east Asian countries. Potentiality of cyanobacteria as biofertilizers, soil conditioners, plant growth regulators and soil health ameliorators has been well recognized (Vaishampayan et al., 2001, Whitton, 2000). Members of the order nostocales and stigonematales are widespread having particular significance in these environments (Desikachary,1959).

The reduction of crop losses is the primary goal of agriculture. Synthetic chemicals have played a fundamental role in suppressing pests and maintaining high crop yields. The world trade of pesticides in 1999 amounted to more than \$22billion, of which about 25% was for fungicides, 35% was for herbicides, and 21% was for insecticides (Food and Agriculture Organization of United Nations, FAOSTAT-Agriculture\Data, <http://apps.fao.org>). The adverse environmental impact of pesticides has become a significant concern, from the mid-1970s. Persistence of the pesticides in topsoils, leaching to groundwater and their undesired effects on non-target organisms are responsible for environmental impacts. Pesticides affect non-target microorganisms including cyanobacteria. The tolerant cyanobacterial strains to a variety of routinely used agrochemicals are suitable biofertilizers in rice fields. Many experimental findings showed adverse effects of pesticides on heterocystous cyanobacteria (Mahapatra et al., 2003; Galhano et al., 2008). Bagalol and Mancozeb (fungicides), Thiodan and phorate (insecticides) inhibited the growth, biochemical composition, nitrogenase and glutamine synthetase activity at EC₅₀ concentration (Debnath et al., 2012). Insecticide profenofos decreased the growth and biomolecules of *Anabaena* sp. (Chaurasia, 2014). Insecticide Malathion is routinely used in agricultural fields of Varanasi. Hence, this experiment was designed to study effects of malathion on growth, biochemical composition

Effects of Insecticide Malathion on growth, biochemical compounds and some enzymes of *Fischerella muscicola* NDUPC001

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Abstract

Malathion effected the growth, biochemical compounds (Chl-a, Total protein and Carbohydrate) and enzymes (nitrate reductase and glutamine synthetase) of *Fischerella muscicola* NDUPC001. 100ppm was LC₅₀ concentration and 50ppm, 100ppm and 150ppm were treatment concentrations. All the treatment concentrations of insecticide inhibited the growth of cyanobacteria. 50 ppm treatment conc. induced the chl.-a and protein content 4.33% and 8.83% respectively whereas other treatments decreased the chl.-a and protein content with max. the decrease of 41.14% and 24.19% respectively in 150 ppm treatment. Carbohydrate content decreased in all treatments with a maximum decrease of 41.71% in 150ppm concentration. Nitrate reductase activity slightly induced (0.31%) in 50ppm treatment and decreased in the other two treatments with a maximum decrease of 27.83% in 150ppm treatment. All treatment concentrations of insecticide inhibited the activity of Glutamine synthetase with maximum inhibition of 34.98% in 150ppm treatment. Cyanobacterial strain showed high tolerance range and lesser inhibitory effects on growth, biomolecules and enzymes.

Keywords: Cyanobacteria, *Fischerella muscicola* NDUPC001 and Malathion

1. Introduction

Cyanobacteria (Blue-green algae) are Gram's negative, ancient, photosynthetic prokaryote. Cyanobacteria are capable of colonizing nearly all habitats on our planet (Whitton & Potts 2000). Role of cyanobacteria in soil genesis and conservation is well established. They constitute the initial successional state on nutrient-poor substrate soil. The algal growth consolidates at the surface leading to the formation of soil crusts, which improves infiltration, limits sheet erosion and provides a substratum suitable for seeds of higher plants for

germination. Photosynthetic nitrogen-fixing cyanobacteria are known to play an essential role in soil fertility especially in the waterlogged paddy fields (Singh, 1961). Now, it is a fact that cyanobacteria are one of the most important sources of biological nitrogen fixers in the paddy field. The paddy field ecosystem provides a favorable environment for the luxuriant growth of the cyanobacteria, concerning light, high water temperature, nutrient availability, etc. This may be reason for the higher abundance of cyanobacteria in rice-field soils rather than other cultivated soils (Watanabe et al., 1971) as reported under widely different climatic conditions in India (Mitra, 1955).

The reduction of crop losses is the primary goal of agriculture. Use of synthetic chemicals in agriculture have played a fundamental role in suppressing pests and maintaining high crop yields. The world trade of pesticides in 1999 amounted to more than \$22 billion, of which 21% was for insecticides (Food and Agriculture Organization of United Nations, FAOSTAT-Agriculture\\Data, //apps.fao.org). Many experimental findings showed the adverse effects of pesticides on heterocystous cyanobacteria (Mahapatra, et al. 2003; Galhano et al. 2008). Thiodan and Phorate (insecticides) inhibited the growth, biochemical composition, nitrogenase and glutamine synthetase activity at the EC₅₀ concentration (Debnath et al. 2012). Insecticide Profenofos decreased the growth and biomolecules of *Anabaena* sp. (Chaurasia, 2014). Insecticide endosulfan inhibited the growth of *Anabaena fertilissima*, *Aulosira fertilissima*, *Westiellopsis prolifica* (Kumar et al., 2012), *Nostoc calcicola* and *Nostoc muscorum* (Prasad et al., 2011). Insecticide malathion is frequently used in agricultural fields of Varanasi. *Fischerella muscicola* NDUPC001 is one of the most abundant cyanobacteria of agricultural fields of Varanasi and report about the effects of malathion on this cyanobacterial strain is lacking.

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Antibacterial Compounds from Heterocystous Cyanobacteria: A Review

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ABSTRACT

Heterocystous cyanobacterial genera *Nostoc*, *Fischerella*, and *Tolypothrix* were extensively explored for antibacterial compounds. Aromatic compounds (Ambigol, 2,4-dichlorobenzoic acid), Alkaloids (Ambiguine, Ambiguine isonitrile, Ambiguine kisonitrile, Ambiguine mesonitrile, Fischambiguine, Eucapsitrione, Fischerindole, Hapalindole, Tjipanazole) and Lipopeptide (Fischerellin), Cyclophane, Diterpenoid, Cyclicdepsipeptide, Linear peptide, extracellular pigments, Polyketide, Cyclic hexapeptides, Phenol, Indane, Terpenoids, Cyclic peptides, Porphinoid, Indolophenanthridine, Cyclic depsipeptides, Macrolide, Lipopeptide, Terterpene and Indole alkaloid are antibacterial compounds isolated from heterocystous cyanobacteria. Only a few genera have been searched for antibacterial compounds. Heterocystous cyanobacteria have rich diversity, and most genera and species have not been explored for antibacterial compounds. Hence, heterocystous cyanobacteria have great potential for drug discovery.

KEYWORDS: Cyanobacteria, Heterocystous, *Nostoc*, *Fischerella*, *Tolypothrix*

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