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Impact of INM on soil properties, plant growth and yield parameters of strawberry cv. Chandler

JITENDRA VERMA • VK RAO

Received: Feb 15, 2013; Revised: May 10, 2013; Accepted: May 23, 2013

ABSTRACT A field experiment was carried out to see the effect of integrated nutrient management on growth, yield of strawberry cv. Chandler and nutrient status of soil under mid hill conditions of Uttarakhand with twelve treatment combinations comprising of inorganic fertilizers (N: P: K), biofertilizers (Azotobacter and PSB) and organic manures (FYM and vermicompost) replicated thrice with 20 plants per replication in randomized block design. Observations were recorded for vegetative growth, fruit yield and chemical properties of soil. Treatment receiving Azotobacter + PSB + vermicompost + 50 % recommended dose of NPK recorded highest plant height plant spread, leaf area per plant. Plant supplied with Azotobacter + PSB + vermicompost + 50 % RDF registered earliest in flowering and fruit maturity and highest number of flowers per plant and flowering duration. The maximum fruit weight, number of fruits per plant, yield per plant (181.84 g), marketable yield per plant (145.47 g) and yield per hectare (101.02 q) were recorded with plants treated with Azotobacter + PSB + vermicompost + 50 % RDF followed by Azotobacter + PSB + FYM + 50 % RDF treatment. The application of Azotobacter + PSB + vermicompost + 50 % RDF was found to more effective in decreasing the electrical conductivity (0.02 dSm⁻¹) and pH (6.27) of soil. The organic carbon (1.95 %), available nitrogen (314.64 kg ha⁻¹), phosphorous (17.56 kg ha⁻¹) and potassium (306.33 kg ha⁻¹) were recorded significantly higher in soil after harvest of the crop in treatment receiving Azotobacter + PSB + vermicompost + 50 % RDF.

KEYWORDS Integrated nutrient management, Azotobacter, PSB, strawberry, yield

INTRODUCTION The strawberry (Fragaria x ananassa Duch.), an aggregate fruit, occupies a significant place in fruit growing, since it can be cultivated in plains as well as in hills. It has gained the status of being one of the most important soft fruit of the world after grapes. Its popularity can be judged from the very fact that total area and production of the world has increased considerably over the past decade. It occupies on area of 243907 ha with a total production of 4366662 tonnes (FAO 2010). It is cultivated to a limited extent in plains and sub mountainous areas of Himachal Pradesh, Uttarakhand, Uttar Pradesh, Maharashtra, Karnataka, Punjab, Haryana and Madhya Pradesh, wherever, irrigation facilities are available in India. In North India, area under strawberry is increasing rapidly due to its remunerative prices. However, in Uttarakhand its area is limited to Dehradun, Udham Singh Nagar and Nainital districts.

Among the various factors which contribute to the growth and yield of strawberry, nutrition is an important aspect of crop production that accounts for about one third of the total cost of production (Bhat 1999, Nazir 2005). At present, chemical fertilizers are not only in short supply but are expensive too. Although these fertilizers contribute a lot in fulfilling the nutrient requirement but their regular, excessive and unbalanced use may lead to the health and ecological hazards, depletion of physico-chemical properties of the soil and ultimately poor yields. Hence, there is need to think of alternate source of safe fertilizers which may enhance crop yields without having adverse effects on soil properties. Organic manures applied to soil improve the soil physical properties, pH, water holding capacity and add important nutrients to the soil thus increase the nutrient availability and its ultimate absorption by plant. Biofertilizers like Azotobacter fix atmospheric nitrogen. The organic manures and biofertilizers help in better utilization of added inorganic
Morphology and yield evaluation of early maturing high yielding cabbage hybrids under rain fed mid hill conditions of Uttarakhand

VIBHA MISHRA • SP UNIYAL • RAJANI RAWAT • MEENAKSHI UNIYAL
Received: July 15, 2013; Revised: August 22, 2013; Accepted: September 10, 2013

ABSTRACT In order to study the morphology and yield performance of some of the newly evolved cabbage hybrids under rain fed mid hill condition of Uttarakhand, an investigation was carried out during kharif season of 2011-12, at the research unit of Department of Vegetable Science, College of Forestry and Hill Agriculture, Hill Campus, Ranichauri, Tehri Garhwal, Uttarakhand. The experiment was laid out in Randomized Complete Block Design with three replications. During the study, observations for stalk length and diameter, leaf circumference and leaf area, number of non-wraper leaves and their weight, plant spread, number of whorls per plant, head size and weight, marketable maturity, head compactness and yield were recorded. The findings of investigation revealed that amongst 12 hybrids, hybrid Green Star was proved the best with respect to disease and pest resistance and head yield. The yield of this hybrid was 389.99q ha⁻¹ and was 36.44 % higher than the standard check Varun. Besides, the other new hybrids which were also found promising in marketable yield along with least incidence of diseases were F₁-Pragati and T-50. Based on overall performance of the different hybrids, it could be concluded that under the prevalent climatic conditions of rain fed mid hill Uttarakhand, Green Star is the most suited hybrid, hence the same is recommended for farmers' commercial cultivation, provided all scientific management practices are followed.

KEYWORDS Brassica. oleracea, cabbage, yield performance, field conditions, hybrids, vegetables

INTRODUCTION
The cabbage (Brassica. oleracea var. capitata) is one of the most important vegetable crops under cultivation. It is thought to have originated in the Mediterranean region (Balkaya et al. 2005) and is in fact one of the oldest vegetables grown. It belongs to the brassicaceae family and is closely related to the broccoli, cauliflower and brussels sprout. It is a leafy vegetable crop that grows close to the ground. The cabbage has been ranked by FAO among the top 20 vegetable crops grown, establishing it as an important food source globally. It has high water content, is high in fibre, and has significant quantities of protein, calcium and iron. The cabbage is a rich source of vit A and vit C in addition to containing some B vitamins (Hasan and Solainhan 2012). It also contains significant amounts of glutamine, an amino acid which has anti-inflammatory properties (Caunii et al. 2010). Researchers have shown that cabbage has a number of anti-oxidative compounds that might be beneficial in the prevention of cancer (Kauszniarewicz 2008).

The cabbage is a cool season crop which grows best under cool, moist weather conditions (Thompson 2002). This leafy vegetable can grow well when a wide range of soil types provided adequate moisture and fertilizer. For a successful cabbage production, however, it is important to select variety appropriate for local growing conditions.

Cabbage cultivation in Uttarakhand hills is a new vegetable enterprise, as its commercial production in the state known to be started only 20-25 years ago. During 2011-12, the state occupied 5,754 ha area under cabbage cultivation with an annual production of 72,701 MT. The crop productivity was only 12.63 MT/ha (Anon 2013), which seems to be reasonably low. The key factor which has been observed responsible for this low yield of cabbage in state is faulty selection of varieties. In spite of great scope of cabbage
In vitro regeneration using nodal sections and shoot tips of gypsophila cv. `Bristol Fairy`

SHAILJA THAKUR • SR DHIMAN • YD SHARMA • AWANI KUMAR SINGH

Received: July 15, 2013; Revised: October 22, 2013; Accepted: October 25, 2013

ABSTRACT Adventitious shoots were successfully regenerated from shoot tip and nodal section explants of Gypsophila paniculata L. The efficiency of shoot regeneration for cv. `Bristol Fairy` was tested on 12 media based on Murashige and Skoog basal medium containing different concentrations of BAP, kinetin and 2ip or their combinations. Highest efficiency of adventitious shoot regeneration was obtained with 6µM BAP when shoot tip explant was used. For in vitro rooting different combination of auxins were used to be best with 100 % rooting of shoots.

KEYWORDS Adventitious shoots, Gypsophila, shoot tip and nodal section explant, regeneration

INTRODUCTION Gypsophila paniculata L. also known as baby’s breath, is an important cut flower in commercial floriculture. In the international cut flower trade, it has occupied 10th position (Singh and Karki 2005). Gypsophila is a member of the family Caryophyllaceae and has 125 known species which are native to temperate region of Eurasia and they include annuals, biennials and perennials out of which Gypsophila paniculata L. is perennial in nature and is the major species used in commercial cut flower production. In gypsophila, propagation through vegetative means is not so easy and plant have always forced difficulties in rooting its terminal cutting.

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Therefore, the use of tissue culture techniques for its further multiplication become important. Among which the tissue culture techniques are becoming popular and also have high potential for molecular breeding.

Researchers like, Kursey et al. (1980), and Henery (1993) have emphasized that adventitious shoot regeneration method is the most reliable for efficiency transformation procedure, but was not so successful.

MATERIALS AND METHODS The experiment was conducted in the tissue culture laboratory of the Department of Floriculture and Landscaping of Dr Y S Parmar University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh in two phases i.e. (i) In vitro shoot multiplication (ii) In vitro rooting

In vitro shoot multiplication

Lateral shoots of Gypsophila paniculata L. cv. Bristol Fairy were obtained from M/s Horti Gen Floral Farm, Jaiujali near Solan. Initially, two explants namely; shoot tip and nodal section were used for carrying out experiments for shoot multiplication. Shoots after harvesting were brought to the laboratory in polythene bags. After removing their leaves, shoots were dipped in 10 % teepol for 10 min and washed afterwards under running tap water. These shoots were then treated with Diathane M-45 (0.2 %) + Bavistin (0.1 %) solution for 15 minutes and again washed with sterile distilled water. Nodal sections and shoot tips of these shoots having a length of approximately one cm were used for in vitro culture after sterilization with HgCl₂ (0.1 %) for different durations. The operations of cuttings of explants from shoots and their sterilization with HgCl₂ (0.1 %) were done under laminar air flow cabinet. Explants were then cultured on MS medium containing different cytokinins i.e. BAP (2, 4, 6 µM), Kinetin (2, 4, 6 µM), 2-iP (2, 4, 6 µM), BAP +kinetin (2+2 µM), and BAP + 2-iP (2+2 µM).
Economics of major cereal and tuber crops grown by the tribal farmers in tarai region of Uttarakhand

SHALINI RAGHAV • SK SRIVASTAVA

Received: May 12, 2013; Revised: October 3, 2013; Accepted: October 10, 2013

ABSTRACT The study conducted in tarai region of Uttarakhand was based on data collected from 45 tribal farmers in the agricultural year 2009-10. The study aimed at examining the cost and return of major cereal and tuber crops grown by the tribal farmers. Economics of the crops was measured using total cost concept. In the study area, it was found that tribal farmers used to grow all the crops which are essential for their livelihood. They grow crops mainly for subsistence not for commercial use. On tribal farms paddy and wheat emerged as major cereal crops which together shared about 92% of the gross cropped area. Total cost of cultivation of paddy was estimated around ₹ 25050 per ha. Net return over variable cost was worked out as ₹ 18585.16/ha whereas, over total cost it reduced to the level of ₹ 6038.20/ha. Total cost of cultivation of wheat crop was estimated to ₹ 25782.28/ha with net return over variable cost as ₹ 17432.24/ha whereas, over total cost it reduced to the level of ₹ 5451.55/ha. Net returns from wheat cultivation were observed less than that of paddy cultivation on tribal farms. Total cost of cultivation of potato was estimated around ₹ 12252.89/ha with net return over variable cost of ₹ 11296.36/ha, which reduced to the level of about ₹ 6895/ha over total cost. They grow crops for subsistence only not on commercial use. The tribal farmers were found comparatively better in farming practices of mainly paddy and wheat but are far behind the potential productivity of these crops in the tarai region of the state. Productivity of potato was quite low. The area has vast potential to grow potato on commercial basis but there is need to tap this potential to benefit the growers. There is need to provide efficient infrastructure support so as to maximize the returns of the growers.

KEY WORDS Tribal farmers, cost of cultivation, returns, cereal crop, potato

INTRODUCTION

The rural population of India also constitutes tribal people who depend on agriculture and allied activities for their livelihood. There are approximately 200 million tribal people in the entire globe i.e., about 4% of the global population. India has the second largest tribal population in the world which constitutes 8.20% of its total population (India 2009). The percentage of tribes living below poverty line is 47.3% in rural and 33.3% in urban areas, which is higher than the corresponding national figures of 28.3% and 25.7%, respectively. Around 80% of the total tribes, both rural and urban, are engaged in the primary sector, essentially agriculture (Bala and Thiruselvakumar 2009). There are 0.25 million tribal people reside in Uttarakhand which constitutes about 3% of state's total population. The tribes constitute weakest section of state's and India's population from the ecological, economical and educational angles (Padhi 2005).

In 1951-52, total food grain production in India was only 51 million tons. Since independence, food grain production in the country has increased by 4.5 times. For the first two decade after independence, India was stressed to meet the demand for food; due to this, the main aim was to produce as much food grain as possible. After 1965, the Green Revolution gave confidence and by the end of 1980s country started producing enough food grain to be self-sufficient. However, during 2000s, many people in certain regions of the country could not get sufficient food despite
Standardization of suitable fertilizer doses of kharif onion for calcareous soils

UDIT KUMAR • RAMJI MAURYA
Received: October 17, 2013; Revised: November 17, 2013; Accepted: November 24, 2013

ABSTRACT An experiment was conducted at Muraul farm of Tirhut College of Agriculture, Dholi, Muzaffarpur, (Rajendra Agricultural University, Pusa, Bihar), during Kharif season of 2010-11 and 2011-12 to find out suitable fertilizer doses of nitrogen, potash and sulphur for kharif onion variety Agrifound dark red under calcareous soil of North Bihar. In the present investigation maximum plant height (59.55 cm) and no. of leaves/plant (10.64) were recorded with highest level of nitrogen i.e., 150 kg/ha, while maximum marketable yield (265.54 q/ha) and total yield (272.89 q/ha) was recorded with 125 kg N/ha. Potash also showed the maximum plant height (56.06 cm), no. of leaves/plant (9.46), marketable yield (230.87 q/ha) and total yield (238.73 q/ha) were recorded with application of 100 kg/ha. Sulphur also showed the maximum plant height (55.52 cm), no. of leaves/plant (9.59), marketable yield (234.49 q/ha) and total yield 242.69 q/ha with highest level of 40 kg/ha. Among various fertilizer combinations the maximum plant height (62.76 cm), no. of leaves per plant (12.60), marketable yield (295.11 q/ha) and total yield 298.72 q/ha were recorded with treatment combination 125 kg nitrogen + 80 kg phosphorus + 100 kg potash + 40 kg sulphur per hectare.

KEY WORDS Kharif onion, nitrogen, potassium, sulphur

INTRODUCTION Onion, the “Queen of the Kitchen” is one of the most commercially valuable vegetables grown in India. Onion (Allium cepa L.) belongs to family Alliaceae. It is considered as a rich source of carbohydrates, proteins and vitamin C besides minerals like phosphorus and calcium. Onion is known for its flavour, pungency and also as an ecofriendly stored grains protectant (Jaggi 2005a). Among fresh vegetables, onion is a pride item of agricultural exports earning valuable foreign exchange to the country and accounts for about 70 % of the total foreign exchange earnings of fresh vegetables (Sirohi and Behera 2003). Onion is one of the few versatile vegetable crops that can be stored for a fairly long period and also can safely withstand the hazards of rough handling including long distant transport.

Onion (Allium cepa L.) is an important vegetable crop commercially grown in India as well as in Bihar. Onion (Allium cepa L.) has great importance in the diet of people. Because, onion has vitamins such as A, B1, B2, C, nicotinicacid, pantothenic acid and important substances such as protein,calcium, phosphorus, potassium and traces of Fe, Al, Cu, Zn, Mn and I. Moreover, it has anti-fungal and antibacterial properties (Augusti 1990). Onion contains an acrid volatile oil with a pungent smell. Researchers showed that onions with higher pungency have better capacity to prevent tumor growth and also, it can protect against heart attack (Augusti 1990). It has been shown that, using of sulfur could increase onion pungency (Lancaster and Boland 1990). Both pungency and volatile S in onions were increased in response to increasing the elemental S applications (Kumar and Sahay 1954). Sulfur compounds responsible for the distinct aromas and flavors in onion are synthesized from a common precursor, the (S)-alk(en)yl-cysteine sulfoxides (ACSOs) which can produce of volatile compounds, pyruvic acid and ammonium (Lancaster and Shaw 1989). Production of onion in a low sulfur environment as compared to high sulfur

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Comparative studies on the sterilization of milk by conventional and microwave process method

B MISHRA • SUNIL KUMAR
Received: September 12, 2013; Revised: September 29, 2013; Accepted: October 10, 2013

ABSTRACT Three types of milks samples i.e. cow milk, buffalo milk and mixed milk (1:1) were processed using conventional heating method and microwave heating methods and stored at room temperature (20-25 °C) for 60 days as well as low temperature (5±1 °C) for 11 months and analysed periodically. Results revealed that microwave processing led to considerable lesser losses in milk quality as compared to conventional heating method. Further, by using microwaves, milk could be sterilized within 20 min, with lesser losses in protein content. The microwave processed milk also had a shelf life of 40 days at room temperature and more than 10 months under refrigeration temperature (5 °C). Therefore microwave processing offer a great alternative to conventional heating, although this demands higher initial capital costs and training of the processor, prior to being used at commercial scales.

KEYWORDS Milk, microwave, sterilization, storage quality

INTRODUCTION
Milk and milk products are an important part in our diet. Milk products provide us nutrition besides adding variety to our food. The annual milk production of our country is more than 100 million tonnes out of which about 55 % is processed for making various dairy products (Dairy India 2006). For sterilization, milk is heated to a very high temperature (114-120 °C) for 20-30 min using conventional methods that lead to loss of nutritional quality besides bringing in undesirable changes in the constituents.

In conventional heating food is surrounded by hot air or water, which heat up the surface of the foods initially and later on to other portions. Thus, foods are cooked throughout by the slow process of conduction. Uses of microwave technology to continuously pasteurize or sterilize dairy and food products can provide a variety of benefits including, improvement of food quality; and extension of shelf life without using preservatives, maintenance of natural appearance, crunchiness and flavour, lower distribution cost, energy saving, low maintenance cost, minimal personnel, and technology that is environmentally friendly. Microwaves could be used in any unit process involving the application of heat. Microwave heating is recently receiving considerable attention due to increasing interest in minimally processed foods.

In dairy industry, the microwave heating of milk has been studied primarily to determine inactivation of milk borne pathogens and also to evaluate its suitability for use in other dairy operations. Several scientists have carried out carefully controlled experiments to demonstrate the effects of microwave on biological materials and have cleared their uses without any health hazards (Hamid 1969, Schwan 1975, Decareau 1985). Although the concept of microwave heating is around forty year old, and microwave heating as such has led to few commercially successful operations, there is lack of full utilization of this energy in dairy industry. There had always been hesitation in investing in a new process until it fertilizers thus reduce its level of application as well as reduce the deleterious effect of harsh chemical residues that the had been evaluated thoroughly. The present study was therefore undertaken to evaluate the physico-chemical and bacteriological changes occurring on processing of milk by using conventional methods and microwave process method.

MATERIALS AND METHODS
In the present study three types of milk were taken i.e. cow, buffalo and mixed. Mixed milk samples were prepared by adding 50 % each of cow and buffalo milk. Raw
Evaluation of suitability of different media for drying of chrysanthemum flowers in mechanical dehydrator

DEENA WILSON • SK SHARMA • BL ATTRI

Received: Sep 30, 2013; Revised: Nov 22, 2013; Accepted: Dec 10, 2013

ABSTRACT An investigation was conducted for evaluation of suitability of different drying media for drying of chrysanthemum (Dendranthema grandiflorum Tzevlev.) flowers at different temperatures and to standardize protocol for drying. Fully opened flowers with one cm stalk were embedded in three drying media viz., sand, silica gel and saw dust and were dried in a mechanically dehydrator at different temperatures i.e. 40, 50, 60 and 70 °C for a duration of 2, 4, 6, 8 and 10 hrs. Results indicated that although maximum moisture loss (78.48 %) was observed in silica gel as drying media but the reduction of flower diameter (1.6 cm) was also highest in the same treatment. Sand was rated to be a better medium than silica gel and saw dust for drying of chrysanthemum flowers. Further, it took 6 hrs at 50°C for acceptable drying of flowers in sand as compared to longer durations of time required by using other two media. Therefore, the protocol for drying of chrysanthemum flowers using sand as a drying media at 50°C for 6 hrs was standardized.

KEY WORDS Chrysanthemum flowers, sand, silica gel, saw dust, mechanical dehydrator

INTRODUCTION

Flowers have always fascinated and dazzled man from being an object of beauty and splendor. Blooms are now rapidly emerging as a money spinning commodity in the global trade. Fresh flowers are one of the main components in floriculture trade as well as in our lives.

Beauty, purity, love and passion are some of the emotions symbolized by the flowers e.g. a lotus conveys purity, rose love, pansy thoughts and narcissus egotism. Flowers have a definite role to play at almost all occasions of human affairs like birth, marriage, worship, adornments and death. An important aspect of floriculture is that it is a good avenue to generate gainful employment for youth and women of sub-urban and rural areas (Sengar et al. 2010).

Fresh flowers are short lived and available during a particular season. Huge quantities of fresh flowers are wasted due to lack of proper marketing channel and some unavoidable circumstances during blooming season (Kher and Bhutani 1979). The beauty and fresh look of flowers can be retained only for a few days when some chemical preservatives are used to prolong their vase life. The charm of fresh flowers can be maintained and preserved for several years by drying and dehydration (by drying the microbial activity and the ageing effect come to stand still in the absence of moisture). Thus, such dried flowers and leaves can be stored for a very long period without losing their appearance and decoration value (Bhutani 1995, Ranjan and Mishra 2002).

Dry flower and plant materials have a tremendous potential as substitute for fresh flowers and foliage for interior decoration along with other artistic and commercial purposes as these are long lasting, possess aesthetic beauty and are available throughout the year. These are also highly suitable for bouquets, flower arrangements, greeting cards, pot-pourri, landscapes and decoration of gift packs. Though,
Profitability of traditional pulse crop cultivation - a study of horse gram (Macrotyloma uniflorum Lam.) in the Kumaun hills of Uttarakhand

MANISHA PANT • SK SRIVASTAVA
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ABSTRACT The study was based on a sample survey of 60 farmers randomly selected from mid hills and high hills of two blocks of Almora district of Kumaon division of Uttarakhand with aim to examine the profitability of horse gram crop. The per hectare cost of cultivation at Cost $C_3$ was about Rs. 8395 and net returns over this cost was Rs. 8905 in the study area. The productivity of horse gram crop was higher in mid hills with 2.90 quintals per hectare. The net returns over Cost $C_3$ were positive indicating that crop was profitable on commercial basis. The material cost accounted for only about 26 per cent in total cost of cultivation. Per hectare cost of cultivation at Cost $B_2$ in mid hills was about 1 per cent higher than that of high hills. The net returns per hectare over Cost $A_1$ was more than 12 per cent in mid hills.

KEY WORDS Cost of cultivation, profitability, rainfed, hills, traditional crop, economics, horse gram

INTRODUCTION India is almost self sufficient in food production but, there exists regional variation among states. Some states are surplus in food production, while others (especially hill states) are deficient (Srivastava, 2011). The traditional mountain agro ecosystems, crops and varieties are the results of farmer’s experience and knowledge that they have gained through centuries (Kumar 2010). Despite intensive developmental interventions farmers did not cease to cultivate native crops, which for the mainstream areas are called traditional crops. These are also called underutilized crops / minor crops / marginal crops / poor men crops / neglected crops. These crops include small millets, pseudo cereals and pulses. The major traditional crops include finger millet (mandua or ragi), barnyard millet (mandira, jhangora or sawan), foxtail millet (kauni), proso millet (cheena), buck wheat (kuttu or ugal), amaranth (chaulai or ramdana), Chenopodium (bathua), horse gram (gahatt or kulth), black soyabean (bhatt), rice bean (naurangi or lobiya) etc.

Traditional crops enjoy a special status in hills of Uttarakhand from time immemorial and are important constituent of hill agriculture. They occupy a part of the rainfed cultivable area in kharif. They are more hardy and low risk crops. They give an assured harvest even when soil moisture and fertility are limiting (Gupta 2006). In fact, the state is manifested with ideal agro-climatic conditions and has vast potential to grow a wide range of these crops. There is a need to tap this potential for the benefit of farmers (Sharma 2005). These crops have occupied area where cultivation of any crop is difficult. This has made them indispensable components in certain ecosystem where farmer has to depend on these crops for substantial part of grain and fodder for his daily need. Traditional crops are being grown in Uttarakhand hills from time immemorial. They occupy a major part of the rainfed cultivable area in kharif. They are more hardy and low risk crops. Although over the years, the production of traditional crops has been, in general, rising in the state, but still its potential has not been fully exploited. Due to poor infrastructure, inaccessibility of technology, small and fragmented land holdings, low investment capacity of farmers and poor marketing facilities, the potential yet cannot be tapped for the benefits of farmers.

Horse gram is a popular pulse, locally known as Gaheth still remain an under exploited legume crop. It is usually grown up to the area at 1800 m amsl (Mehra and
Effect of different pruning intensities on the growth, yield and fruit quality of Starking Delicious apple under mid hill conditions of Himachal Pradesh

LK SHARMA • KC SHARMA • VINOD SHARMA • AK SHARMA

ABSTRACT An on farm trial on the effect of varied pruning intensities on apple cultivar Starking Delicious was conducted in four different locations of Kullu district. There were five pruning intensities which were replicated in four different locations. The plant growth increases with the increase in severity of pruning, conversely fruit yield decrease with the increase in pruning severity. Fruit size and total soluble solids also increased with the increase in pruning intensities.

KEY WORDS Apple, Starking Delicious, apple, growth

INTRODUCTION In Himachal Pradesh the productivity of apple varies between 6-7 tonnes per ha as compared to 25-30 tonnes per ha in the developed countries like USA, UK, Australia, Canada etc. The causes of low productivity of apple are many, but faulty pruning is also one of the major factors contributing towards low yield and quality. Productivity of fruit trees is influenced by photosynthesis, which may be altered by cultural practices such as pruning and tree nutrition (Childers and Cowart 1985). One of the main purposes of pruning is to facilitate light penetration into the bearing area of the tree. It also helps in maintenance of optimum C: N ratio crucial for apple development.

MATERIALS AND METHODS Present study was conducted in four different locations namely Sarsari, Seobag, Nagni and Boshadhar of Kullu district during 2008-09 and 2009-10 on twenty year old Starking Delicious apple, raised on seedling rootstock spaced at 6 x 6 m apart. There were five pruning intensities which were replicated in four different locations under Randomized Block Design. The details of different pruning intensities as given below:

T1: No heading back only thinning out
T2: ¼ heading back and thinning out
T3: ½ heading back and thinning out
T4: ¾ heading back and thinning out
T5: Farmers’ practice (Control) i.e. more heading back and less thinning out

Pruning was done in the second week of January every year. Ten shoots were randomly selected around the periphery of the tree and their extension growth was measured before pruning and the results were expressed as cm shoot⁻¹.

Fruit set was recorded three weeks after petal fall and percentage fruit set was calculated by following formula given by Westwood (1993).

\[
\text{Fruit set (\%) = \frac{\text{Number of fruit set}}{\text{Number of flowers cluster x 100}}}
\]

Fruit yield was recorded by removal of crop load during harvesting season as kg / tree based on 20 Kg standard apple box and later converted in to t/ha.

The weight of fruit was taken with the help of a top pan balance. The unit sample consisted of ten fruits and the
Drought stress on yield performances of three mung bean (Vigna radiata (L.) Wilczek) varieties in Sri Lanka

DISNA RATNASEKERA • SAP MADURANGI
Received: June 25, 2013; Revised: July 30, 2013; Accepted: August 5, 2013

ABSTRACT Mung bean (Vigna radiata) is a tropical pulse crop mainly cultivated in the dry zone of Sri Lanka which faced frequent drought stresses. Drought can be affected to the quality and quantity of the yield. Therefore, this study was carried out to identify the critical growth stages of the plant that can be affected to the yield and to select the most suitable drought tolerant variety. The study was carried out as pot experiments using a Mung bean variety, ARI, MI 5 and MI 6 imposing drought at vegetative, flowering and pod filling stages. Plants were watered up to the field capacity at three days interval in control treatment. The experiment was arranged in a Completely Randomized design (CRD) with five replicates. Mean number and weight (g) of pods, grains per pod, shrink grains per pod, number of discolored grains per pod, pigmented stem height at 2 weeks and 3 weeks after sawing and the germination percentages of seeds from different treatments were recorded. The results revealed that moisture stress was significantly reduced (P<0.05) the mean number and weight (g) of pods while number and weight of shrink grains per pod was increased. Number of grains per pod was not affected. Variety MI 5 produced least number and weight of shrink grains per pod. The highest number of grains per pod was recorded in variety MI 5 and MI 6. There is no significant effect of variety and stage of drought stress imposed on number of discolored seeds per pod, weight of grains per pod and for germination of seeds from different treatments. Hence variety MI 5 can be considered as most suitable drought tolerant variety among tested varieties.

KEY WORDS Vigna radiate, drought stress

Mung bean (Vigna radiata) is one of the most important grain legumes of the arid and semi arid tropics. In Sri Lanka, Mung bean is grown in either as rain fed or under limited irrigation water. Therefore, the crop always subjected to moisture stress of different degrees during all the stages of the crop development.

Water stress has an effect on the physiological processes of the plant. Mung bean lacks osmotic adjustment and developmental plasticity, which makes crop unable to withstand under water stress. Furthermore, the water extraction capacity of mung bean is low during the vegetative period (Chiang and Hubbell 1978). Hence the yield of mung bean under stress is generally decided by its capacity to grow vigorously and accumulate as much as dry matter possible before anthesis.

Some studies reported that moisture stress during early growth and grain filling stages is critical, which influence the reduction of the plant growth and ultimately reduce the grain yield (Boyer 1987). Moisture stress significantly reduced the yield of mung bean variety MI 6 and the reduction was highest when the stress was imposed during the flowering stage and at the vegetative stage (Srikrishnah and Mahendran 2007).

This study was an attempt to screen 3 mung bean varieties (ARI, MI 5, MI 6) which was commonly cultivated in Sri Lanka in favor of drought resistance. Critical evaluation of some characteristics which was very important to withstand under moisture stress may provide valuable information about drought resistance of the tested varieties and will be beneficial for the breeding programs of mung bean in future.

The experiment was conducted in the poly tunnel (Temperature 31°C - 32°C, Light intensity112x102 - 834x102) of the research field, Faculty of Agriculture, University of Ruhuna, Sri Lanka as a pot experiment (24 cm height and 24 cm diameter). Two third of the pots were filled with soil and basal dressing was applied to the top 2cm layer of soil at the rate of 35-100-75 kg/ha of Urea-TSP-M OP respectively and
Temperature forecasting using artificial neural networks (ANN)

PANKAJ KUMAR • PS KASHYAP • JAVED
Received: Feb 5, 2013; Revised: June 22, 2013; Accepted: July 10, 2013

ABSTRACT The objective of this paper is to develop an artificial neural network (ANN) model which can be used to predict weekly mean temperatures in Pantnagar, Uttarakhand, India. In order to determine the optimal network architecture, various network architectures were designed; different training algorithms were used; the number of neuron and hidden layer and transfer functions in the hidden layer/output layer were changed. Training of the network was performed by using Levenberg–Marquardt feed-forward back-propagation algorithms. Root mean square error and correlation coefficient statistics was used to measure the performance of the models. The results show that the ANN approach is a steadfast model for weekly temperature prediction.

KEYWORDS Forecasting, temperature, artificial neural network

Weather prediction is a complex process and a challenging task for researchers. It includes expertise in multiple disciplines. The prediction of atmospheric parameters is essential for various applications. Some of them include climate monitoring, drought detection, severe weather prediction, agriculture and production, planning in energy industry, aviation industry, communication, pollution dispersal (Pal et al. 2003). Accurate prediction of weather parameters is a difficult task due to the dynamic nature of atmosphere. Stochastic weather generators have been proposed as one technique for simulating time series consistent with the current climate as well as for producing scenarios of climate change. Various techniques like linear regression, auto regression, Multi-Layer Perceptron, Radial Basis Function networks are applied to predict atmospheric parameters like temperature, wind speed, rainfall, meteorological pollution etc. (Nayak et al. 2004, 2005). It was found that the non-linear operator equations governing the atmospheric system are the ones who can better understand the dynamics of atmosphere.

ANN was first introduced as a mathematical aid by (McCulloch et al. 1943). They were inspired by the neural structure of the brain. Fig. 1 is a general architecture of a Feed Forward ANN, with one hidden layer. Most ANNs have three layers or more: an input layer, which is used to present data to the network; an output layer, which is used to produce an appropriate response to the given input; and one or more intermediate layers, which are used to act as a collection of feature detectors. The ability of a neural network to process information is obtained through a learning process, which is the adaptation of link weights so that the network can produce an approximate output. In general, the learning process of an ANN will reward a correct response of the system to an input by increasing the strength of the current matrix of nodal weights.

There are several features in ANN that distinguish it from the empirical models. First, neural networks have flexible nonlinear function mapping capability which can approximate any continuous measurable function with arbitrarily desired accuracy, whereas most of the commonly used empirical models do not have this property. Second, being non-parametric and data-driven, neural networks impose few prior assumptions on the underlying process from which data are generated. Because of these properties, neural networks are less susceptible to model misspecification than most parametric nonlinear methods.
Effect of varieties and dates of transplanting on head yield and profitability of broccoli in hills of Uttarakhand

SP UNIYAL • KUMKUM SHARMA • MEENAKSHI UNIYAL

ABSTRACT Three hybrids viz., Fiesta (Bezo Sheetal Pvt Ltd Jalana), Premier and ATX-218A (Takii and Company Ltd., K yoto, Japan) and an open pollinated variety viz., KTS-1 (I ARI, K abin, Himachal Pradesh) were tested at four dates of transplanting viz., 27th June 07th July, 17th July, and 27th July under rainfed mid hill conditions of Ranichauri. The experiment was laid out in split plot design with three replications. Data was recorded on yield of marketable head (q/ha). Economical parameters viz., cost of cultivation, gross and net return per hectare, percent increase in net return over check and B:C ratio were worked out. Based on the findings of present investigation, it can be concluded that treatment combination transplanting of Fiesta hybrid on 27th of July was most suitable for getting highest yield and maximum net profit under rainfed mid hill conditions of Uttarakhand, provided all scientific management practices are followed. Beside this, another profitable treatment combination which could also be recommended to vegetable growers of Uttarakhand is transplanting of Premier hybrid on 27th of July.

KEY WORDS Broccoli, varieties, transplanting, economics, profitability

Broccoli or Sprouting Broccoli (Brassica oleracea var. italica L.), a member of cole crops belongs to the family Brassicaceae. Compared to cabbage and cauliflower, broccoli is nutritionally very rich in protein (3.6 %), fat (0.3 %), carbohydrate (5.9 %), vitamin A (9000 I.U), calcium (2-16 %) and iron (684 ppm) (Bose and Som 1986). This nutritious vegetable also contains a chemical known as indole-3-carbinol, which is supposed to possess anticancerous properties (Rai and Yadav 2005). Production and consumption of Broccoli is limited to some pockets in India viz., J and K and Himanchal Pradesh. Presently, Himanchal Pradesh is known to be a leading state in the country for broccoli production of 600-700 tonnes on an area of 50 hectares, annually (Rai and Yadav 2005). Broccoli can grow well during winter season in India. So there is a good scope of its export during this period to Gulf and other developed countries with unsuitable climatic conditions and also to (Thamburaj and Singh 2003).

In Uttarakhand, Broccoli is less popular among vegetable growers. However, researchers/farmers experience revealed that this nutritious exotic vegetable could be grown in the state without much difficulty. Considering off-season nature of the crop, congenial climate of the region and high demand of produce in metropolitan cities, further give an opportunity to the vegetable growers of Uttarakhand to grow this crop on a large scale. Yields of cruciferous crops are often adversely affected by fluctuating temperature (Csizinszky 1987, Csizinszky and Schouter 1988). Hence, planting dates have significant impact on the marketable yield. Thus, there is a great potential of increasing the productivity per unit area by timely planting of the crop. It is indispensable to standardize the technologies on various production aspects, particularly varietal selection, optimum planting date and doses of fertilizers in broccoli for higher and economic yield.
Integrated management of tomato (Lycopersicon esculentum Mill.) diseases under mid-hill sub-humid conditions of Himachal Pradesh

VK RATHEE • KC SHARMA
Received: June 25, 2013; Revised: July 30, 2013; Accepted: August 5, 2013

ABSTRACT An experiment comprising of ten treatments was conducted on commercial variety Solan Gola to study the effect of different cultural/sanitation practices alone or in combination with fungicidal sprays on the incidence of foliar and fruit rot diseases of tomato. All the treatments were superior to control but none of the treatment could surpass the standard check. However, recommended chemical control of diseases and weeds recorded a marketable yield statistically at par with the standard check. Minimum incidence of Alternaria (6.65%) and buckeye rots (6.20%) were recorded in the standard check. Removal of diseased plant parts only and hand weeding only recorded significantly higher marketable fruit yield and lower incidence of fruit rots as compared to the control. Removal of lower leaves produced higher yield and recorded significantly lower incidence of diseases in comparison to the treatments where this practice was not followed.

KEY WORDS Tomato, buckeye rot, alternaria, cultural practices, fungicides

Tomato (Lycopersicon esculentum Mill.) is grown as an off-season crop from spring to early winter in Himachal Pradesh, which gives lucrative returns to the farmers. However, various fungal diseases afflict the crop and the diseases like early blight (Alternaria solani), Alternaria rot (Alternaria alternata) and buckeye rot (Phytophthora nicotianae var. parasitica) are serious diseases during this period because of warm and humid climate. These diseases are often quite destructive, causing heavy losses to the farmers in terms of yield and quality of fruits. Protective sprays of non-systemic fungicides like dithio-carbamates (Choulwar and Datar 1992), Copper oxychloride (M.reshwari et al. 1991) and Captan (Vakalounakis and Malathrakis 1988) were found effective up to some extent. Besides the chemical control, Sharma et al. (1976) reported efficacy of different cultural practices in controlling the buckeye rot. Similarly Dodan et al. (1994) and Sharma (1992) studied the effect of combination of chemical and cultural control measures on incidence of buck eye rot but effective economic, eco-friendly and complete control measure is still lacking. Hence the present investigation was undertaken to evaluate fungicidal control alone and/or in combination with various cultural and sanitation practices against these diseases under sub-humid conditions of Himachal Pradesh.

To find a suitable control of Alternaria leaf blight, buckeye rot and alternaria rot of tomato through combined use of fungicidal spray of Mancozeb (Indofil M-45 @ 0.25%) and various cultural/sanitation practices, a field trial consisting of 10 treatments replicated thrice was laid out in Randomized Block Design at Experimental farm of Hill Agricultural Research and Extension Centre (HAREC), Bajaura. In each plot (1.8 m x 1.8 m), 12 seedlings of highly susceptible cultivar Solan Gola were transplanted in two rows at 90 x 30 cm spacing in mid-April to ensure that the fruiting period coincide with the period of maximum disease development (July to August). The following combinations of treatments were used: (i) Hand weeding + 3 sprays of Mancozeb (Indofil M-45 0.25 %), (ii) Removal of lower leaves up to 10 cm + 3 sprays of Indofil M-45 (0.25 %), (iii) Removal of lower leaves up to 20 cm + 3 sprays of Indofil M-45 (0.25 %), (iv) Removal of lower leaves up to 30 cm + 3 sprays of Indofil M-45 (0.25 %), (v) Removal of diseased plant parts only, (vi) Recommended chemical control of
Effect of neem-based pesticidal formulations and insecticide on mobility of second stage juveniles of Meloidogyne incognita

SATYA KUMAR • SARVESH MISHRA • GEETA SHARMA • RAM NATH
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ABSTRACT In-vitro study of aqueous extracts of neem-based pesticidal formulations (neem seed kernel, achook, nimbecidine, repline, Juanine, neem oil) and one insecticide (monocrotophos) was evaluated to find out their effect on mobility of second stage juveniles of Meloidogyne incognita. The mobility of second stage juveniles of Meloidogyne incognita was found to be affected markedly in the higher exposure timing and higher concentrations. Monocrotophos, neem seed kernel and achook caused maximum immobility to larvae in the present findings.

KEYWORDS Meloidogyne incognita, neem, pesticidal formulations, monocrotophos, larvae

With the increasing health consciousness of people and increasing incidences of various human diseases being originated from one of the other type of chemicals used in agriculture, there has been a lot of emphasis on the use of natural and safer chemical in management of various pests in agriculture. It has been broadly realized that most of the pesticides used in nematode management are highly hazardous and expensive. The nematicidal property of many plants are known since time immemorial and neem (Azadirachta indica) has been reported to have nematicidal properties. Neem leaves, neem cake and neem oil have been reported to be effective against root-knot nematode by many workers (Khan et al. 1974, Siddiqui 1986, Alam et al. 1975, Mojumder and Mishra 1991a, Ram and Gupta 1980).

Mojumder (1995) stated that crude water extract from fresh or dried neem products have nematicidal potential particularly against plant parasitic nematodes. Whereas, Siddiqui and Alam (1985) have observed that fresh extracts of neem fruit, leaf, bark, root and gum inhibited hatching of Meloidogyne incognita. In the present investigation an attempt has been made to evaluate the efficacy of neem based formulations along with an insecticide against second stage juveniles of M. incognita.

To test the efficacy, and nematicidal potential, two powdered, neem seed kernel, and achook, three liquid neem products, nimbecidine, repline, juanine, neem oil and one insecticide i.e. monocrotophos were included in the experiment.

Aqueous extracts of six neem based pesticidal formulations viz: neem oil (liquid) and one insecticide i.e. monocrotophos liquid were prepared by soaking 25g/oil each in 100 ml of fresh water for 24 hours and then homogenized mechanically and filtered through muslin cloth followed by Whatman filter paper No. 1 (Mojumder and Mishra 1991a). The extracts thus obtained were considered standard extracts (with 100 % conc) form which other concentrations like 0.25s, 0.50s and 1.00s were prepared by taking 10 ml of which other concentrations like 0.25s, 0.25s and 1.00s were prepared by taking 10 ml of formulations in 100 ml of water and drops of Triton-x (emulsifier) was added. Other concentrations of 0.25s, 0.50s and 1.00s were prepared from
GUIDELINES FOR AUTHORS

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### Abbreviations for citing references

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<p>| Congress                           | Congr                                       |
| Contribution(s)                    | Contrib                                    |
| Conservation                       | Conserv                                    |
| Cooperative                        | Coop                                       |
| Culture                            | Cult                                        |
| Current                            | Curr                                       |
| Cytology, -ical                    | Cytol                                       |
| Department                         | Dept                                        |
| Development                        | Dev                                         |
| Digest                             | Dig                                         |
| Disease                            | Dis                                         |
| Dissertation                       | Diss                                        |
| Distribution                       | Distrib                                     |
| Division                           | Div                                         |
| Ecology, -ical                     | Ecol                                        |
| Ecosystem(s)                       | Ecosyst                                     |
| Economy, -ic, -ics                 | Econ                                        |
| Education                          | Educ                                        |
| Egypt                              | Egypt                                       |
| Egyptian                           | Egyptn                                      |
| Electronic                         | Electronic                                  |
| Encyclopedia                       | Encycl                                      |
| Engineers, -ring                   | Eng                                         |
| Enology                            | Enol                                        |
| Entomology, -ical                  | Entomol                                     |
| Environment                        | Environ                                     |
| Enzyme (s)                         | Enzym                                       |
| Experimental                       | Expt                                        |
| Enzymology                         | Enzymol                                     |
| Experimental                       | Exptl                                       |
| Microscopy                         | Microsc                                     |
| Molecule, ar                       | Mol                                         |
| ppm, ppb                           |                                             |
| @ per cent                         |                                             |
| litre or liter                     | l                                           |
| Messrs                             | M/S                                         |
| meter, metre                       | m                                           |
| milligram                          | mg                                          |
| parts per million, parts per billion | ppm, ppb                          |
| ha⁻¹ or l⁻¹ or kg⁻¹                |                                             |
| square meter, cubic meter etc       | m², m³ etc                                  |
| such as i.e.                       | i.e.                                        |
| volume by volume                   | v/v                                         |
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Summary

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<th>Type of membership</th>
<th>Fee for SAARC countries (per year)</th>
<th>Fee for rest of the nations (per year)</th>
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<td>Annual member</td>
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<td>US $ 30 per year</td>
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<td>Subscriber (organization) member</td>
<td>₹ 1,500/-</td>
<td>US $ 100 per year</td>
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1. Through Bank Draft: May remitted through demand draft drawn in favour of INDIAN SOCIETY OF HILL AGRICULTURE payable at SBI Branch CHAMBA (Uttarakhand), Branch Code : 6534. The draft may be sent to the Editor-in-Chief Journal of Hill Agriculture through registered post only alongwith duly filled membership form which can be downloaded from our website.

2. By Direct Deposit into ISHA's Bank Account: Membership fee i.e. ₹ 3000/- or ₹ 500/- or ₹ 1500/- as the case may be, plus ₹ 50/- (as bank charges) amounting to ₹ 3050/- or ₹ 550/- or ₹ 1550/- respectively, may also be directly deposited into the Bank Account of Indian Society of Hill Agriculture. The details are given as follows

   Name of Bank: State Bank of India
   Name of Branch: Chamba (Uttarakhand)
   Branch Code: 6534
   For NEFT/RTGS Transfer IFSC Code: SBIN 000 6534
   Name of Account Holder: Indian Society of Hill Agriculture
   Account No.: 3119 0343 798

   Important Note: If you directly deposit the fee into ISHA's account please do not forget to send your duly filled (i) duly signed membership form, (ii) bank transaction Id (iii) scanned copy of stamped deposit slip (counter foil). The information may be sent by e mail to editorinchiefjha@gmail.com
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2. Date of Birth: .............................................................................................
3. Designation / Job Title: ................................................................................
4. Specialization: ............................................................................................... 
5. Institute / Organization where employed: ......................................................

6. Address for Correspondence: ........................................................................
   Phone: ................................ Fax:......................................... E mail: ......................
7. Permanent Home Address: ............................................................................
   Phone: ................................ Fax:......................................... E mail: ......................
8. Academic and Professional Qualifications:
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9. Category of membership (please tick)
   (i) Life member   (ii) Annual member   (iii) Organization/ Subscriber member

10. Payment of membership fee in (Rs) ............................................. By direct deposit in ISHA
    account / Online transfer to vide transaction No. ......................... dated: .................

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Place: ......................... Name: ..................................................
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VIBHA MISHRA • SP UNIYAL • RAJANI RAWAT • MEENAKSHI UNIYAL

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