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Indian Society of Hill Agriculture (ISHA) was founded in 2010 having its secretariat at G.B. Pant University of Agriculture and Technology, Hill Campus, Ranichauri, Distt Tehri Garhwal, Uttarakhand, India with the main objective to cultivate and promote research, education and development of agriculture and allied branches of science with special emphasis on development of hill and mountain regions of the world.

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Dear readers, researchers and members

I am very happy to present before you the first issue of the second volume of Journal of Hill Agriculture. I wrote in my editorial published in the last issue, that a revolution similar to the green revolution is still awaited in hill agriculture and we all have to join hands for achieving satisfactory advancement in the field of agricultural development in hills to make people self sufficient and to meet future demand of food. On these lines, efforts were made to have a scientific interaction of people of eminence in agriculture from various parts of the country. The National Symposium on Technological Interventions for Sustainable Agriculture which is being jointly organized by Indian Society of Hill Agriculture (ISHA) and G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, w.e.f 3-5 May, 2011 at Hill Campus Ranichauri, is the outcome of initial efforts of ISHA in this direction. About 300 participants including, personalities of eminence in Indian agriculture, scientists, teachers, researchers, students, farmers, NGOs, private players, financial institutions etc. are expected to participate in the event. I am sure the deliberations made during the symposium shall be of great use to all. A special session of scientist interaction has also been planned for framing a policy and collaborative research projects for future research and development programmes on hill agriculture.

As far as the journal is considered, I am grateful to ISHA, its members, and especially the office bearers and members of the editorial board of JHA, who have put all their efforts to achieve targets set for the journal. The overwhelming response of authors by contributing papers for the journal from India as well as abroad was also worth appreciation. Our journal is available in print as well as online mode. Authors are enjoying the online submission and processing of manuscripts. Although, we have published papers on many aspects of hill agriculture including, agronomy, fruit science, vegetable science, soil science, postharvest technology, agricultural extension, agricultural economics, mushroom, plant protection, biotechnology, microbiology, forestry, animal science etc. in the initial issues of JHA, papers from persons of eminence in Indian agriculture have also been published in each issue and has been an important component of JHA, generally not found in many of the journals.

In order to meet international requirements of the journal, and to improve its quality, circulation and impact, we have restructured the editorial board, this year, by adding many members from various countries around the world. We have received appreciation from various parts of the world on the timelines followed by us for publishing the journal, speed of processing the manuscripts at our end and the quality of research work published. We often also try to suggest modifications in presentation of the results for improving the quality of papers instead of mere accepting or rejection the papers. This issue of JHA is published two months in advance for ensuring its release during the symposium and its wide circulation among the readers. I hope, in following years also, we shall bring out the issues well in advance of the timelines.

I hope readers would welcome this issue of JHA and contribute their work for publication in their own hill journal.

(Satish Kumar Sharma)
Editor-in-Chief, JHA
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This issue of Journal of Hill Agriculture was published on the occasion of National Symposium on Technological Interventions for Sustainable Agriculture, 3-5 May, 2011, Ranichauri
Sustainability factors of hill agriculture and opportunities

TEJ PARTAP

Received: April 14, 2011

PREFACE

Farmers Commission, “Serving farmers and saving farming” points to rising acute agricultural distress in the rain fed areas of the country, which also includes hilly areas. It lists five basic cause factors that are central to the crisis; unfinished land reforms, water scarcity, technology fatigue-access-adequacy, institutional support and opportunities for marketing. While working for National Commission on Farmers as hill agriculture expert, the contributions on the hill agriculture perspective, gathered knowledge and information about Himalayan farmers state of affairs, of global experiences etc, made by me in compiling the hill farmers section of the main report of the commission, also form the basis of this paper.

The focus of this paper is on highlighting the challenges facing hill farmers and how they can be addressed. Paper, first dwells on the scale and dimensions of the problems of hill farmers, including the two most significant common concerns, increasing crop land scarcity and water scarcity to maintain agriculture on marginal lands. It explains various dimensions of the new thinking on marginal lands and implications. Next section, describes how similar problems were addressed by other nations, successfully. To highlight the point that technological options are and have been available, report includes examples of right technological hits of the Himalayan region. The last section, analyses opportunities to find solutions to hill farmers distress.

Much of the farming development efforts made in the hills in the past were based on poor understanding of the hill/ mountain conditions, resources, environment and the socio cultural setting of the people. The mainstream thinking on hill agriculture development was dominated by the biases against hill farming, marginal land based limitations, forest conservation as priority etc. Many of these perceptions may be unfounded.

This paper does not lay out any solutions, any technological options or any development strategy. It bares problems and indicates possible pathways. To define an action plan would need much deeper knowledge and understanding of the potentials and the crisis undercurrents across the hilly regions. The intention is not to provide a blue print for action but to stimulate critical understanding of tangled, multifarious processes.

STATE OF HILL FARMERS AND FARMING

Among the 34 million people that inhabit the Himalayan region, large percentage is of hill farming communities (mountains included). They sustain on largely subsistence farming which they practice on marginal rain fed and some irrigated farmlands occupying 15.8 % of the total area of the Himalayas i.e. 53.8 million hectares. Rest of the Himalayan landscape, includes rangelands, pastures, wasteland, the so called bush lands-the grazing areas and the forests; all these account for nearly 69 % of the Himalayan area. Another 15.2% is under permanent snow cover and rocky mountains and serves as perennial source of clean water to the hill people as well as to rest of the nation. Agriculture is the primary sector of the economy, contributing 45% to the total regional income of the inhabitants. The great majority of the farming households in the Himalayan states have landholdings of less than 0.5 ha or small landholders with farms of 0.5 to 1.0 ha. While average land holding in Himachal Pradesh is about 1.2 ha it is even smaller (0.97ha) in Uttarakhal (Table 1).

In the north- eastern Indian Himalayas, shifting cultivation or “jhum” accounts for 85% of the cultivated area and supports over 1.6 million people, largely tribal
Proteinase inhibitors in legumes - a review

SANJIVAN BAHMAN • ALKESH

Received: Sept 24, 2010; Revised: January 10, 2011; Accepted: February 16, 2011

ABSTRACT Proteinase inhibitors (PIs) are anti-metabolic protein and have been well established to play a potent defensive role against predators and pathogens. PIs are found in most of the organisms, mainly in plants among different families and particularly abundant (1-10% of total proteins) in storage organs like seed and tubers. These endogenous proteinases act as storage proteins and function as specific substrates for the digestive proteinases of insect forming a stable complex in which proteolysis is limited and resulted extremely in slow development of insects. The inhibitors from different legumes have been isolated and their respective genes have been used for the construction of transgenic crop plants to be incorporated in integrated pest management programs.

KEYWORDS Proteinase inhibitor, legumes, trypsin inhibitor, isolation, purification, characterization, chromatography

INTRODUCTION

It has been estimated that world wide crop losses without the use of pesticides and other non-chemical control strategies is about 70% of crop production (Lawrence and Koundal 2002) and the pre-harvest losses due to insect pests, despite the use of insecticides is 15 % of total production (Krattiger 1997). The exclusive use of chemical pesticides not only results in rapid build up of resistance but their non-selectivity affects the balance between pests and natural predators and is generally in favour of pests (Metcalf 1986). Therefore, integrated pest management programme, comprising of practices including judicious use of pesticides, crop rotation, field rotation and above all, exploitation of inherently resistant plant varieties would provide the best option (Meiners and Elden 1978).

For future it is necessary to develop a more environment friendly agricultural system which will have decreased inputs in energy and chemicals and will not generate harmful outputs such as pesticide residues. Adopting new technology of plant genetic engineering offers different approaches to establish insect resistant plants. Expressing foreign insecticidal genes to make transgenic plants contributes a significant role in sustainable agriculture. The commercial introduction of Bt transgenic during the last decade, so far, resulted in the development of resistance by pest, therefore, there is a need to discover new, effective plant genes which would offer resistance or protection against pests. Legumes are the prime source of proteinase inhibitors which possess highly proven inhibitory activity against insect pests and also improve the nutritional quality of food.

PLANT PROTEINASE INHIBITOR

Higher plants contain a set of diverse polypeptides that are synthesized during embryogenesis and stored in the quiescent seeds, a large proportion of which are abundant storage proteins that are hydrolyzed following germination. Other seed proteins of lower abundance include the proteinase inhibitor, a multifamily group of proteins. Plant proteinase inhibitors (PIs) are small proteins, generally present at high concentration in storage tissues (up to 10% of protein content), but also detectable in leaves in response to the attack of insects and pathogenic microorganisms (Ryan 1990).

OCCURRENCE AND DISTRIBUTION

The occurrence of proteinase inhibitors in plants has been known since 1938 and they are extremely widespread in their distribution throughout the plant kingdom (Ryan 1973). Majority of proteinase inhibitors studied in plants

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Preparation and evaluation of appetizers from lactic acid fermented vegetables

VK JOSHI • SOMESH SHARMA • NEERJA RANA

ABSTRACT In the present study, an attempt was made to develop and evaluate the appetizers from fermented vegetables. The vegetables were fermented using sequential culture of lactic acid bacteria viz., Lactobacillus plantarum (NCDC 020), Pediococcus cerevisiae (NCDC 038) and Streptococcus lactis var diacetylactis (NCDC 061) as per the conditions optimized earlier. Different combinations of fermented vegetables viz., carrot, radish and cucumber with pear and mango pulps were made separately and were processed as per the routine practice. All the appetizers were prepared using common recipe of appetizer preparation having a constant TSS of 45°B and different combinations of fermented pulp viz., 10, 20 and 30 % with fruit pulps of mango, apricot and pear as per the respective combinations. The titratable acidity of carrot, radish and cucumber based appetizers ranged from 1.12 to 1.72 %. The blending ratio influenced the titratable acidity, brix-acid ratio, pH and colour of the appetizers. Physico-chemical and sensory characteristics of all the appetizers prepared met the specifications of Fruit Products Order (FPO), Government of India. Among various carrot and cucumber based appetizers, products prepared with fermented carrot only and the appetizer with a blend of 10 % fermented cucumber + 20 % apricot were preferred to others. In the sensory quality evaluation, the fermented radish based appetizer having 20 % radish + 10 % apricot was rated the best. Out of the three vegetables and pulps, radish based appetizer having 20 % radish + 10 % apricot had the highest overall acceptability and was rated the best. The cost of production of fermented vegetable based appetizers ranged between Rs. 10.70 to 11.08 per 200 ml bottle. The lowest (Rs. 10.70 per 200 ml bottle) cost was recorded for carrot based appetizer containing fermented carrot only followed by radish appetizer.

KEYWORDS Lactic acid fermentation, lactic acid bacteria, fermented vegetables, appetizer, carrot, radish, cucumber

INTRODUCTION

India is the second largest producer (129077 MT) of fruits and vegetables (NHB 2009) in the world but unfortunately, due to the lack of postharvest infrastructure and processing capabilities, a lot of produce goes waste, resulting in a huge loss of these natural resources. Among different vegetables produced and consumed in India, carrot (Daucus carota), radish (Raphnus sativus) and cucumber (Cucumis sativus), occupy a significant place in Indian diet as salad and cooked food. These vegetables in their natural state can be preserved for a very short period only and thus, their availability to the consumers remains seasonal. Among different methods, fermentation is one of the oldest methods of food preservation in the world. Fermentation using natural or starter culture has emerged to be a cheap method of preservation, besides preparation of new products with diversified taste and flavour. The tremendous increase in consumer demand for fresh-like products containing natural ingredients, changing food patterns and convenience have led to the development of minimally processed products using lactic acid bacterial (LAB) cultures. Recently, the presence of bacteriocin, an antimicrobial substance in these products have also attracted the attention of scientists (Joshi et al. 2006). Lactic acid fermentation using LAB culture is normally employed to prepare fermented grape juice, fermented peanut milk, yoghurt, fermented corn meal,
Evaluation of some IRCTN rice genotypes for cold tolerance and leaf blast disease under temperate Kashmir conditions

GS SANGHERA • AM HUSSAINI • ALI ANWER • SC KASHYAP

ABSTRACT In this study, 68 IRCTN genotypes of rice were grown under temperate conditions for their evaluation to cold tolerance and leaf blast disease. Eighteen genotypes were found cold tolerant based on spike fertility (>90%) and seedling colour score (<3). However, evaluation against leaf blast resistance revealed that none of the genotypes was immune or highly resistant, while 21 genotypes were resistant and 18 were moderately resistant that exhibit blast incidence less than 10% and 11-20%, respectively. Morphological observations showed that low temperature resulted in stunting of plant, delayed growth and poor panicle exsertion which led to poor phenotypic acceptability of genotypes in general. Four genotypes viz. IR1367, L10573, MILLIN and OLBYE 2 were found to be promising possessing cold tolerance (>90% spikelet fertility) coupled with leaf blast resistance (PDI<10%) and other desirable traits showing their usefulness in future rice breeding.

INTRODUCTION

Rice (Oryza sativa L.) is an important cereal crop and a staple food for majority of people in Kashmir. In the valley it is cultivated within an altitude of 1560-1800 m asml, expanding 30.25° to 35.2°N latitude and 74° to 75.25° E longitude. The entire area is irrigated and the source of irrigation is melting snow at the higher ranges adversely affect the establishment of rice nurseries (Sanghera and Wani 2008). Further, the mean temperature during the growing period ranges from 13° to 26°C. The growing period is limited to 120 to 135 days. During the growing season, the temperatures are rather low. The days are long, nights are cool and wider differences exist between daily maximum and minimum temperatures. The lower temperature at seedling (April-May) and reproductive stages is one of the major problem results in slow establishment and low seed set which leads to poor yields of the crop (Sanghera et al. 2001).

The incidence of leaf blast (Magnaporthe grisea) is another major constraint to adoption of modern rice cultivars in temperate conditions, which occurs sporadically every year but may occur in severe form (endemic form) in such a growing season when, water stress, medium temperature (20-22°C), cloudy weather with high humidity prevails for a longer period results in tremendous losses in rice production. Therefore, the reported is an attempt to know the suitability of some exotic IRCTN (International Rice Cold Tolerance Nursery) genotypes possessing tolerance to low temperature and blast disease under temperate condition of Kashmir valley.

MATERIALS AND METHODS

The material used for study consisted of 68 genotypes originating from 11 countries obtained from IRRI, Manila, Philippines under INGER (International Network for Genetic Evaluation of Rice) programme to determine their suitability under temperate conditions of Kashmir. The composition of entries obtained in IRCTN involves both indica (20) and japonica (48) ecotypes of rice. Thirty day old seedlings of these genotypes were transplanted in 4 rows of 3 m length (unreplicated). Seedlings were transplanted at the rate
Response of yield and quality attributes of litchi cv. Dehradun to soil and foliar application of boron

AK BANYAL • AK RANGRA

ABSTRACT  A field experiment was conducted during 2005 and 2006 at Regional Horticultural Research Station, Jachh, Kangra, Himachal Pradesh to evaluate response of boron application on fruit yield and quality of litchi cv. Dehradun. Experiment comprised of foliar application of borax @ 0.2, 0.4, 0.6% and soil application of borax @ 100, 150, 200 g/tree in pre bloom stage. Borax applied at the rate of 0.4 % in mid February and 1st week of May as a foliar application, resulted in highest fruits set (59.00) per panicle, fruit retention (22.58%), fruit yield (18.08 kg tree⁻¹), lowest fruit drop (77.42%) and fruit cracking (7.47%) indicating better response of plants to foliar application of boron as borax @ 0.4%. 

KEYWORDS Litchi, boron, fruit set, fruit cracking

INTRODUCTION

Litchi (Litchi chinensis Sonn.) an important subtropical evergreen fruit crop belonging to family Sapindaceae, is believed to have originated in China, where it has been grown in Southern Guangdong State for thousands of years. It is highly specific to climatic requirements and probably due to this reason its cultivation is restricted to few countries in the world. In India, Litchi was introduced in the 18th century through Burma, and from there, it spread to many countries. India and China account for 91% of the world lychee production but it is mainly marketed locally. In India, 418,000 metric tonnes of Litchi is produced annually from 69,000 ha (Anon 2008). Litchi being specific in climatic requirement is confined to a few states with 74% of production recorded in Bihar.

Nutrition plays an important role in overall productivity of plants. Various biotic and abiotic factors, nutritional deficiencies especially of boron have been assigned as reasons for poor fruit set, high percentage of fruit cracking and fruit drop by numerous workers (Chadha and Rajput 1969, Pujari and Syamal 1977, Singh and Lal 1980, McConchie and Batten 1991). Moreover, widespread deficiencies of boron were reported (Awasthi et al.1975, Chandel and Sharma 1992) in the litchi growing areas of Himachal Pradesh.

The key to the mineral nutrition of any orchard is the judicious application of fertilizers on the basis of leaf and soil analysis. The determination of nutritional need of crop is an important aspect of nutrient management for the orchardist and leaf analysis has been widely used as an analytical tool in understanding the nutritional requirements (Montanes et al. 1993). In order to meet out the nutritional requirements of the fruit trees, soil and foliar application plays an important role, but their efficacy differ significantly through their mobility in soil and plants. No doubt many workers have reported that foliar and soil application of nutrient elements improve fruit set, retention, yield and reduce the extent of fruit cracking, but the results are inconsistent. Hence, the present study was made to evolve the optimum dose of boron on improving fruit set, retention, yield, quality and reducing fruit cracking of litchi cv. Dehradun.

MATERIALS AND METHODS

The present investigations were undertaken in the experimental orchard of the Regional Horticulture Research Station, Jachh, Kangra, Himachal Pradesh, during 2005 and 2006. The experimental area is located at an
Constraints for vegetable production in the hilly regions of Jammu division

NEERJA SHARMA • ARUN GUPTA • RK ARORA

ABSTRACT Vegetables provide essential vitamins, minerals, fibre and nutrients that are important for good health. The daily requirement of vegetables in human diet in India is 300g/day/person but we are able to produce only 245g/day/person still short of 55g/day/person. In India about 60 vegetables are being grown however, a planned development in the field of vegetable production to improve the nutritional availability for masses is still required. Vegetable farmers of district Poonch of Jammu and Kashmir are facing various constraints in vegetable production so the study entitled “Constraints in vegetable production in the hilly areas of Jammu Division” was conducted in three vegetable growing villages covering marginal, small, and big farmers (20 from each category totaling 60 in number). A pre tested interview schedule was prepared to collect the data and appropriate statistical procedure was employed to analyze the data for different constraints like social, organizational, technology transfer and economic. The study revealed that mean score for all these constraints were higher among marginal farmers as compared to small and big farmers for vegetable production in Poonch district.

KEYWORDS Vegetable production, social, organizational constraints, technology transfer

INTRODUCTION Vegetable production in India prior to 1947 was only 1.5 million tonnes. Today, India is the 2nd largest producer of vegetables in the world after China with an annual production of 111.8 million tonnes from an area of 6.755 million ha. After independence, growth rate in value of fruits and vegetables production rose to 2.50% as compared to 0.6% in 1950-59. The per capita production of vegetables was meager 30 kg in 1981-85 and rose to 100 kg during 2008-09, thanks to innovative and risk taking farmers and introduction of high yielding technologies by private and public sector undertakings (Kumar et al. 2009).

India, with its wide variability of climate and soil, has good potential for growing a wide range of vegetable crops. Since the mid eighties, Government identified horticultural crops as a means of diversification for making agriculture more profitable through efficient land use, optimum utilization of natural resources and creating skilled employment for rural masses, especially women folk with the past efforts rewarding. India requires about 127.2 million tonnes of vegetables other than potato and tubers to meet the nutritional requirements of 1200 million people by 2020-21 but at present the production level is only 111.8 million tonnes (Kumar et al. 2009) so far 230 high yielding open pollinated varieties, 99 hybrids and 40 vegetable varieties resistant to biotic and abiotic stresses have been released by public funded research in India. Even though the productivity levels of our crops have increased still it will not be sufficient to feed the increasing population.

Poonch is the smallest district of the Jammu and Kashmir state. It is situated between 33°25' to 34° north latitude and 73°25' to 74°33' East longitude at a height of 3300 m amsl and spread over an area of 1674 km² with geographical area of 1.14 Lakh ha. It is surrounded by
Effect of planting date, nitrogen and phosphorus levels on marketable bulb yield in garlic (Allium sativum L.) under mid hill conditions of Himachal Pradesh

BS Thakur

ABSTRACT Cultivation of garlic in the mid hills of Himachal Pradesh is being done in a haphazard manner resulting in poor bulb yield in a highly suitable climate. To standardize proper time of planting and the optimum levels of nitrogen and phosphorus fertilizers for increasing the productivity of the crop an experiment was conducted at an elevation of 1100 m amsl. The experiment consisted of five planting dates starting from 30th August to 20th November, four levels of nitrogen (62.5, 93.75, 125.0 and 156.25 kg ha⁻¹) and three phosphorus levels (38, 76 and 114 kg ha⁻¹). The results indicated that the early planting of garlic cloves on 30th August and 20th September resulted in increased plant growth and highest marketable bulb yield of 25.8 tonnes ha⁻¹ and 25.6 tonnes ha⁻¹ respectively. The plant growth as well as marketable bulb yield decreased to 15.6 tonnes ha⁻¹ with delay in the planting time up to 20th November. Application of nitrogen @ 156.25 kg ha⁻¹ and phosphorus @ 114 kg ha⁻¹ resulted in highest marketable bulb yield of 23.2 tonnes ha⁻¹ and 22.2 tonnes ha⁻¹ respectively amongst the different nutrient levels. Increasing levels of nitrogen and phosphorus had a positive effect on the plant growth as well as bulb yield irrespective of the date of planting. 20th September date of planting accompanied by application of nitrogen @ 156.25 kg ha⁻¹ and phosphorus @ 114 kg ha⁻¹ was found to give maximum profit therefore recommended for mid hill conditions of Himachal Pradesh.

INTRODUCTION Garlic (Allium sativum L.), is known as a valuable spice for good health and a popular remedy for various ailments and physiological disorders. India is the second largest producer of garlic in the world however, its productivity is 5.23 tonnes ha⁻¹ as against world average of 15 tonnes ha⁻¹ (NHRDF 2008). Himachal Pradesh, a hill state in northern India under western Himalayas has witnessed an increase in garlic producing area during last decade. The bulbs produced in the state are also qualitatively better than the other garlic growing states in the country. Although the climatic conditions are favourable for garlic cultivation however, the productivity of garlic in the state is less than the national average. The main reason for low productivity is haphazard planting of the crop and scanty information on proper planting date and supply of nutrients to this crop under the mid hill conditions of western Himalayas. Therefore present investigations were undertaken to study the effect of planting dates, different levels of nutrients viz. nitrogen and phosphorus on plant growth and marketable bulb yield of garlic variety ‘Agrifound Parvati’.

MATERIALS AND METHODS The experiments were conducted on garlic variety ‘Agrifound Parvati’ during winters of 2007-08 and 2008-09, at Regional Horticultural Research Station, Bajaura (31.8°N, 77°E and 1100 m amsl) Distt Kullu, Himachal Pradesh. Garlic seed was procured from NHRDF and was of good quality and free of any diseases and insect pests attack. The treatments consisted of five planting dates (30th Aug., 20th Sep., 10th Oct., 30th Oct., 20th Nov.); four nitrogen levels (62.5, 93.75, 125.0, 156.25 kg ha⁻¹) and three phosphorus levels (38, 76, 114 kg ha⁻¹). The fertilizer sources for nutrients were calcium ammonium nitrate...
Effect of dilution and de-acidification on physico-chemical and sensory quality of seabuckthorn wine

VK JOSHI • RAKESH SHARMA • SOMESH SHARMA • GS ABROL

ABSTRACT
Amongst different products that can be prepared from seabuckthorn, wine is one which is difficult to prepare due to high acidity of the pulp. So, efforts were made to prepare seabuckthorn wine by diluting the pulp with water in the ratios of 1:5, 1:6, 1:7 and 1:8 in one set and de-acidification of pulp with sodium bicarbonate at different concentrations (0.6, 0.8, 1.0 and 1.2 %) in the second to reduce the acidity. The pulp was ameliorated with sugar (24° B), 100 ppm SO₂ and 0.5 % pectinase enzyme and with or without DAHP (0.1 %) and fermented with pure wine yeast culture Saccharomyces cerevisiae var. ellipsoideus (5 % v/v) at 22±1°C. Seabuckthorn must prepared by dilution had better fermentation behaviour than that prepared by NaHCO₃. Addition of DAHP in general, enhanced both the rate of fermentation as well as ethanol content. Highest rate of fermentation (RF=0.80) was recorded in 1:5 dilution with 0.1 % DAHP. After fermentation, wines prepared by diluting the pulp had the ethanol content of 9.3 to 13.18 % v/v while that by NaHCO₃ ranged between 8.06 to 10.2 % (v/v). The highest alcohol content was recorded in must made with 1:6 dilution with 0.1 % DAHP followed by 1:5 dilution with 0.1 % DAHP. The wines prepared with DAHP @ 0.1 % had higher ethanol content than those without DAHP. Among the physico-chemical characteristics, TSS ranged between 6.8 to 10.2 °B, whereas titratable acidity (as % citric acid) ranged between 0.96 to 2.48 depending on the level of dilution employed or de-acidification carried out by the use of NaHCO₃. The total sugars in different wines ranged from 1.5 to 3.35 per cent while ascorbic acid content was recorded between 400 to 800 mg/100 ml. Sensory quality of the wine prepared from seabuckthorn pulp by diluting (1:5) with 0.1 % DAHP and alcohol content of 11.6 % v/v was adjudged the best on the basis of characteristics like colour, aroma, body and overall acceptability.

KEYWORDS Seabuckthorn, Hippophae rhamnoides L., seabuckthorn wine, de-acidification, dilution, ethanol, acidity

INTRODUCTION
Seabuckthorn (Hippophae rhamnoides L.), belonging to Elaeagnaceae, is a thorny, dioecious bush growing wild in the cold and dry regions of Indian Himalayas mainly in Ladakh (Jammu and Kashmir), Lahaul- Spiti and Kinnaur (HP), Kumaon-Garhwal (Utrakhand) and Sikkim/Arunachal Pradesh in the north-east region of India. Fruit is the main component of value, although the leaves are occasionally made into seabuckthorn tea. The ripe fruits of seabuckthorn are rich source of vitamins (A, B, C, K and E) with antioxidant and anti- stress properties. There are two main valuable products that can be derived from the berries, ‘juice’ from the fleshy tissue and ‘seed’ as a single seed from each berry. The juice provides a nutritious beverage, high in suspended solids and rich in vitamin C and carotenones. The seed is a source of seed oil, which is very unsaturated and shows phytopharmaceuticals properties. Extracted pulp can be utilized to some extent for the preparation of different value added products like squash, nectar and jam etc. (Sharma et al. 2004, Dwivedi et al. 2004). However, in-spite of high nutritive value and good pharmaceutical potential not much scientific research work have been made in the efficient utilization of seabuckthorn berries in India. On the other hand preparation of fermented
Effect of *Leucaena* based hedge row intercropping on forage crops

APSINGH  •  NILAY KUMAR  •  SUSHMA

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ABSTRACT An experiment was conducted to study the effect of *Leucaena* based hedge row intercropping on forage crops viz. Napier bajra hybrid (PBN-233, perennial), maize (J-1006) + cowpea (Cowpea-88) and Berseem (BL-10) + Rye grass (Rye grass No.1). The three varieties of *Leucaena* viz. K-8 (*L. leucocephala*), K-156 (*L. diversifolia*) and K-743A (*L. leucocephala x L. diversifolia*) were grown between the rows of forage crops. The results confirm that there was no effect of *Leucaena* varieties on the total production of forage crops as the effect of different sources were found non-significant for the yield of forage crops except for the Berseem + Rye grass combination. However, K-8 performed best giving 19.70 and 2.20 tonnes/ha of green and dry biomass yield respectively with Berseem + Rye grass combination. It also gave better results in comparison to control proving that such silvipastoral system is likely to improve the quality and quantity of forage/fodder crops and will simultaneously improve the social and economic status of the farmers also.

KEYWORDS Fodder crops, silvipastoral, hedge row system, intercropping, forage crops

INTRODUCTION The development of viable technologies for small farming system and rangeland in tropics is a challenge. To improve the productivity of traditional farming systems and to conserve the soil resources of deforested lands, livestock are an important for the rural poor. Worldwide, 50% poor people own livestock and depend on them for their livelihoods (ILRI 2007). Livestock are living assets contributing to food security and are an important source of protein and minerals for nutritional security. There is increasing demand for livestock products worldwide in the form of meat, milk and milk products such as cheese and butter. This offers the poor livestock producers, significant opportunities to increase benefits from their livestock and raise income through livestock markets. Access to fodder and water are often identified as major constraints to livestock productivity. This inability to feed livestock adequately remains one of the most widespread global constraints in the livestock sector. Overcoming it, would assist smallholder livestock producers to improve their livelihoods by taking advantage of market opportunities and building assets.

Growing multipurpose trees along with agricultural or fodder crops under silvi-pastoral system has gained considerable importance in India in recent years due to its ability to combine forestry (perennials) with agriculture (annuals) or livestock on the same unit of land using management practices, suiting to the cultivable characteristics of the local people and the economic as well as ecological conditions of the area. It brings about maximization of land use and boosts the rural economy in the form of additional income. A number of indigenous as well as exotic multipurpose tree species including *Bauhinia, Prosopis, Grewia, Celtis, Robinia, Leucaena* etc. are studied for fodder production. *Leucaena* is one of the potential species, which has higher number of uses and is primarily known for fodder, fuel and small timber (Burley and Carlowitz 1984).

*Leucaena* belongs to sub-family Mimosoidea of family Leguminosae and native to Mexico and Central America. The species is a good source of fodder and fuelwood (calorific value of 4640 to 4675 kcal/kg) and
Evaluation and characterization of some exotic plum germplasm accessions for fruit quality traits

DINESH SINGH • VK SHARMA • KRISHAN KUMAR

ABSTRACT A study was undertaken on 17 exotic plum germplasm accessions during the year 2009-2010 under Nauni-Solan conditions of Himachal Pradesh. The data were recorded on 19 fruit quality characters comprising 15 metric and 4 non-metric characters. Based on the evaluation and characterization of fruits, some plum varieties excelled in major economically important traits. Fruit weight varied from 14.40 - 62.19 g, TSS 11.00 – 19.20°B, sugar :acid ratio 0.7 – 3.75 and pulp:stone ratio 19.10 - 49.10. As many as six germplasm accessions had fruits with red purple colour, four grey purple, three red, two green with red blush, one yellow and one yellow orange with red purple blush. Only four genotypes viz; Frontier, Azarshah and Queen Rosa produced fruits of desirable quality.

KEYWORDS Plum, variation, characterization, evaluation

INTRODUCTION

Plum is one of the important and widely cultivated stone fruits predominantly grown in sub-temperate regions of different states of India. In Himachal Pradesh areas ranging from 900 m to 1600 m asml provide excellent and congenial climatic conditions for its cultivation and the crop has assumed greater significance as fresh fruit and in processing industries. In India, the area under plums is 21,000 ha with a production of 1,60,000 MT (FAO 2008). Santa Rosa is the predominant plum cultivar grown over 90% of the total area under plum cultivation. Not withstanding the commercial acceptance of Santa Rosa, its over dominance leads to a monoculture like situation and reduced returns due to gluts in the market. To meet ever-changing consumer preferences and spread of harvest, there is a need to have varietal diversification with genetically improved cultivars. The exotic plum germplasm with an array of varieties exhibit tremendous variability in growth, yield and quality attributes. The present study was undertaken to evaluate 17 exotic plum germplasm accessions under Nauni-Solan conditions of Himachal Pradesh. The present efforts aim at highlighting the importance of evaluation and characterization of exotic plum germplasm for their commercial exploitation and utilization in future breeding for improved fruit quality traits.

MATERIALS AND METHODS

The present study was undertaken during the year 2009-2010 on 17 exotic plum germplasm accessions viz., ‘Au Amber’, ‘Au-Rosa’, ‘Azarshah’, ‘Black Amber’, ‘Cacanska Rana’, ‘Cherry Plum’, ‘Florida 1-2’, ‘Frontier’, ‘Kanto-5’, ‘Laroda’, ‘Queen Rosa’, ‘Red Ace’, ‘Red Beaut’, ‘Ruby Sweet’, ‘Santa Rosa’, ‘Shiro 14-4’ and ‘Tarrol’ under Nauni-Solan conditions of Himachal Pradesh. The data were recorded on 19 fruit quality characters comprising 15 metric (Table 1) and 4 non-metric (Table 2) characters. Standard descriptors (IPGRI 1984) were followed to record data and physico-chemical analysis was carried out using methods of AOAC (1970). Statistical analysis was carried out as per method given by Panse and Sukhatme (1985). A random sample of 10 fruits in three replicates were taken from each plum genotype and observations were recorded on various fruit quality characters viz., fruit weight (g), fruit length (mm), fruit breadth (mm), TSS (°B), acidity (%), reducing sugars (%), non-reducing sugars (%), stone weight (g), stone size (mm) and pulp:stone ratio. Fruit size was measured with digital...
Effect of chemicals, GA treatment and packaging on shelf life and quality of apple

KANIKA ISSAR • MC NAUTIYAL • SK SHARMA • TS BISHT

ABSTRACT

Apple fruits treated with 10 % Nipro fruit wax and stored under ZECC conditions were found to be the best for extended shelf life and quality. ZECC showed lower mean physiological loss in weight (2.28 %) while, the ambient conditions recorded higher % of weight loss (7.93 %). The mean physiological loss in weight were 6.87 and 3.34 % in the fruits stored under normal and modified atmosphere respectively. Among various treatments, fruits treated with CaCl$_2$ and Bavistin showed minimum signs of rotting during storage. Apple fruits can be successfully stored under zero energy cool chamber conditions (temperature 3.10 to 19.80 $^\circ$C) for a period of about 100 days after treating with 10 % wax. Also, the shelf life can be improved and quality can be retained by treatment with 2.5 % CaCl$_2$ and Bavistin 200 ppm along with storage under ZECC conditions after packing in micro perforated polythene bags, with minimum changes in physico-chemical and sensory quality parameters.

KEYWORDS

Apple, CaCl$_2$, GA, Bavistin, waxing, ZECC, ambient, modified atmosphere

INTRODUCTION

Apple is the most important temperate fruit crop in India. Due to its perishable nature, it can not be stored for long duration, under ambient conditions. Postharvest losses in the terms of quality and quantity occur at various stages of fruit handling right from harvesting, till the fruits reach the consumer due to lack of proper infrastructural facilities, cold chain, packaging etc. Due to the ever-increasing demand of good quality fruits, the growers are forced to produce good quality fruit and minimize quality loss during transportation and storage in order to fetch remunerative prices for their produce (Sharma 2010).

For the last some years, waxes, chemical treatments i.e. GA, Calcium chloride, fungicides have been tested for increasing shelf life of fruits. Further, extension of shelf life of fruits by storage in low cost structures has also attracted interest of poor farmers in India and has become quite popular in some places. The on- field storage of fruits in zero energy cool chamber (ZECC) was found to be highly successful in the retention of fruit quality characteristics and the growers can withhold the transportation of their produce to the markets during glut period for sometime and as soon as the prices shoot up, they can take out the stored produce from ZECC and make handsome returns during the lean periods by sale of their produce (Sharma and Nautiyal 2007, Issar et al. 2010, Sharma et al. 2010).

The present study was therefore undertaken to study the effect of various chemical treatments and packaging under different storage atmospheres for extending the shelf life of apple fruits in open and low cost storage structure i.e. ZECC, so as to develop a recommendation for the use of poor farmers in developing country like India, where the advanced modern storage facilities are beyond the reach of common farmer.

MATERIALS AND METHODS

The present investigation was conducted in the Department of Horticulture, G. B. Pant University of Agriculture and Technology, Hill Campus, Ranichauri, District Tehri-Garhwal, Uttarakhand, state, India, during October, 2005 to January, 2006. Apple fruits of cv. Royal Delicious, harvested at optimum maturity, from private orchards in Harsil area of district Uttarkashi, Uttarakhand, India were procured and brought to the laboratory of
Effect of age of transplants on growth and yield of tomato
(Solanum lycopersicum)

YR SHUKLA • THUKTAN CHHOPAL • RAJENDER SHARMA • RAKESH GUPTA

ABSTRACT A study was conducted to assess the effect of age of transplants on growth and yield characters of tomato cv. Solan Vajr in an experiment laid in RBD with 3 replications. Ten ages of transplants starting from 15 days old with a gap of 3 days comprised the treatments. Maximum values for most of the characters like survival of seedling after transplanting (100%), number of fruits per plant (19.50), fruit yield per hat (37.2 tonnes), plant height (165.67 cm) and harvest duration (44 days) were recorded using 33 days old transplants. It was concluded that 33 days old transplants were best regarding growth and yield of tomato under mid-hill conditions of Himachal Pradesh.

KEYWORDS Tomato, age of transplants, fruit yield, harvest duration

INTRODUCTION

Tomato, a member of family solanaceae is an important commercial summer season vegetable crop grown all over the world. It is used raw as salad or cooked as vegetable. Tomato is universally treated as ‘Protective Food’ because of its high nutritional value and number one processed vegetable. Tomato fruit provides on an average 900 IU/100g vitamin A and 23 mg/100g vitamin C.

Mid-hills of Himachal Pradesh are the leading suppliers of tomato to the plains. It is grown during summer and rainy seasons in the hills and the produce is sent to the markets of the adjoining states. The farmers thus earn a lot of money on account of premium price as these crops cannot be grown in the plains during summer months because of high temperature. In Himachal Pradesh, about 9,388 ha area produces 3,17,700 tonnes tomato with a productivity of 33.84 tonnes/hectare (Anon 2006).

The performance of any crop depends upon the quality of the seed used for sowing, environmental factors, type of cultivar and cultural practices. Among these, optimum age of transplant is one of the factors which affect growth and yield. But generally, this factor is being ignored by the farmers. The optimum seedling age depends on the soil, environmental factors (temperature, moisture), location and cultural practices. Several investigations have been made to see the effect of transplant age on crop performance. Yield of tomato transplants ranging from 3 to 6 weeks old either increased linearly with age (Weston and Zandstra 1989) or was not influenced by transplant age (Leskover et al. 1991). The conflicting results in the literature on transplant age may be due to different environmental and cultural conditions that the plants were exposed to, both in the greenhouse and in the field. Generally, 4-6 weeks old transplants are recommended for transplanting in mid hill regions of Himachal Pradesh (Anon 2008) but this is a very wide range. Exact age of transplant would therefore be helpful in understanding the relationship between the physiological stage of transplant, its survival in the field and their growth responses under various cultural systems and environments. So, in order to generate recommendations, the present investigation was conducted to ascertain the optimum age of transplants for maximization of fruit yield of tomato.

MATERIALS AND METHODS

The experiment was conducted at Vegetable Research Farm, Department of Vegetable Science, Dr YS Parmar University of Horticulture and Forestry, Nauni, Solan (Himachal Pradesh) during summer season of 2008. The
Existing calf rearing and milking management practices followed by dairy farmers in Uttarakhand

SUNIL KUMAR • BK MISHRA

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ABSTRACT
A field survey was conducted to acquire the first hand information on existing calf rearing and milking management practices. The present study was conducted in Chamba, Narendra nagar and Fakot blocks of Tehri Garhwal district in Uttarakhand. Data collected by using structured schedule from 240 households of 12 villages and compiled for study. It was observed that all the respondents attended their dairy animals as well as calf at the time of calving. Majority (90.83 %) of the respondents were following the practices of cleaning the calf and trim hooves immediately after birth and allowed the dam to lick their calf. The practice of cut and disinfect naval cord and put disinfectant on cut portion of naval cord were follow by only 15 % cattle keepers. The results indicated that majority (77.92 %) of the respondents followed knuckling method of milking. Almost all (94.17 %) the farmers follows stripping at the end of milking. The respondents rarely (13.33 %) changed milker. None of the respondent used scientific milking pail for milking. Majority (90.84 %) of the cattle keepers clean their utensils by detergent and water. None of the respondent wiped the udder and teats just after milking. Majority (98.75 %) of the respondents followed intermittent milking method for drying of late pregnancy. A large percentage (78.75 %) of dairy owners allowed calf for suckling before and after milking. All the respondents practiced let down of milk through calf suckling. The practices of dry hand milking and scaling of teat canal at the end of lactation where not followed by any of the respondent.

KEYWORDS
Calf rearing, management practices, milking, mountain, dairy

INTRODUCTION
Dairy farming is an integral part of mountain agriculture. Smallholders comprising majority of mountain farmers are accustomed to rear some animals as an essential component of the farming system. Among the various basic needs the animals fulfill, milk is the most important for a family. Dairy animals are the best means to convert local vegetative biomass into useful products and work, and the high value biodiversity into the products of still higher value, such as dairy products fondly consumed by masses. That is why the dairy animals have been occupying predominant place in the herd in mountain region.

Calves play an important role in the development of the dairy sector of the country, as the future of the dairy herd solely depends upon the successful raising of young calves. Female calves are especially kept for herd replacement. The male calves are usually kept up to weaning when they are sold. Calf-care is not only essential for sustenance of the dairy industry but is also essential for preserving and maintaining our good quality germplasm. Important aspects in the calf rearing are the health management and proper nutrition (Mehmood 1991).

Self sufficiency in milk production is possible only through the adoption of improved management practices. Keeping in view the growing importance of commercializing the livestock sector to meet the challenges of globalization, in terms of organized production and marketing, a need was felt to study the rural dairy farms in Tehri Garhwal district of Uttarakhand regarding the buffalo calf health and managemental
Selection of indigenous pecan \(Carya illinoensis\) (Wang) K.Koch. trees for better nut and kernel quality characters

DINESH SINGH • KRISHAN KUMAR • SD SHARMA • VK SHARMA

ABSTRACT The present study was undertaken on 36 pecan \(Carya illinoensis\) (Wang) K Koch. trees pre-selected from a total of 75 trees of semi-cultivated conditions growing in district Chamba of Himachal Pradesh. Based on the characterization and evaluation of nuts and kernels, pecan trees excelled in major economically important characters. All the 36 seedling trees exhibited extreme variation for individual traits. Nut weight varied from 3.97-10.03 g, shell thickness varied from 0.30-1.85 mm, kernel weight from 2.32-5.73 g, kernel percentage 37.54-73.74\%, kernel protein 0.78-11.33\%, kernel oil 44.28-74.40\%. As many as 14 selections had kernels with golden colour, 20 with light brown, 1 with dark reddish brown and 1 with brown colour. Only six genotypes viz., Tree No. 40, Tree No.41, Tree No.20, Tree No.10, Tree No.2 and SP-2 produced nuts and kernels of desirable quality. The present effort aims at highlighting the importance of selected pecan trees of seedling origin in previously unexplored region from conservation and breeding point of view.

KEYWORDS Pecan nut, kernel, evaluation, diversity

INTRODUCTION Pecan nut \(Carya illinoensis\) (Wang) K.K.Koch., a valued nut for high calorific value (~680 calories/100g kernel), is well adapted under sub-tropical regions (Texas, Australia, Canada, Egypt, India, Israel, Mexico, Morocco, Algeria., Peru, Turkey and South Africa) of the world. The estimated world production of pecan is around 800 million pounds from an area of about a million acres (Anon 2006). Pecan is superior to walnut in quality (flavour, 65-70\% fats, 8-10\% proteins, high in phosphorous, potassium and vitamins A,C,E and B complex) and thrives best in the area which are considered somewhat lower and hotter for walnut cultivation (Herrera 1995, Sparks 2000). Though, introduced in Palampur, H.P. way back in 1930 (Awasthi et al.1980) this nut crop could not assume commercial status for the want of suitable cultivars among orchardists. Nevertheless, there is huge potential of this nut crop to commercialize being hardy to climatic vagaries and having export value. The existing population at Palampur, Mandi, Chamba and Solan comprising the tree of seedling origins exhibit tremendous variability in growth, yield and quality attributes thereby providing a platform for exploitation of vast gene pool. Meager efforts have been made for selection of superior seedling pecan genotypes with desirable traits especially economically important nut and kernel traits. The present study to select superior pecan nut genotypes from semi-cultivated population of seedling origin is an effort to promote pecan cultivation via putting into place superior genotypes.

MATERIALS AND METHODS The experimental material included 36 bearing (20-25 years old) pecan tree selections of seedling origin, presently growing at Research Farm of KVK, Chamba (University of Horticulture and Forestry, Nauni, Solan, Himachal Pradesh) located at 950 m amsl between N32°32'-N32°43' and E75°59'-E76°21' were evaluated during 2008-2009. A random sample of 30 nuts from each seedling tree was taken and observation on various nut and kernel characters were recorded as per descriptor of pecan (Grauke and Thompson 2011). Nut and kernel weight was weighed on digital balance.
Participation of women in decision making process in rural Garhwal of Uttarakhand

BK KHANDURI • CHANDRA DEV

ABSTRACT The study was based on 110 women respondents selected randomly from Chamoli district of Uttarakhand with the aim to examine the participation of women in decision-making process related to home and farm affairs. The study revealed that the overall pattern of decision-making process related to home and farm affairs, the maximum decisions were taken by all family members (33.64 %) followed by 27.27 %, 20.91 % and 18.18 % decisions taken by women and male, women alone and male alone, respectively. The study also revealed that the participation of women in decision-making process related to home affairs was comparatively lower (13.64 %) than farm affairs (28.18 %), while in case of males, the situation was just reverse as the participation of male in decisions related to home affairs (27.27 %) was higher than the farm affairs (7.27 %). Thus, males were dominating the scene regarding decisions related to home affairs as compared to their female counterparts, whereas in decisions relating to farm affairs it was the women who dominate the scene. This is a unique situation of the rural Garhwal of Uttarakhand, where women perform more than 80 % home and farm activities but their participation in decision-making has been less than 20.91 %. It shows that there was a clear-cut gender bias in the society, which explains traditionally subjugated status of women, as well as their role in decision-making process. These gender biases shall improve with the improvement in the education of women in rural areas of Uttarakhand.

KEYWORDS Participation, decision-making, women, home affairs, farm affairs

INTRODUCTION

Women are not only the carriers of human race, but civilization itself rests on them. They are the best upholders of environmental, ecological and social balances, even at the cost of personal loss and sacrifice. The world economic profile of women shows that they represent 50 per cent of the population, make up 30 % of the official labour force, perform 60 % of all working hours, receive 10 % of world income and own even less than 1 % of the world’s property (FAO 1980). In spite of this, the fact remains that women all over the world, and India in particular, are under the strict subjugation of males and consequently have little say in decision-making. Similar is the case of women in relation to decision-making in agriculture and farm operations. Patal et al. (1994), Nasreen et al. (1996) and Kachroo et al. (2005) have pointed out that the women are ignored in the process of decision-making to such an extent, that the extension and development agents have been approaching the farm families to improve the role of rural women in decision-making. They have not been treated as equals, and have always depended upon the male folk for every type of decision.

In Indian society generally males are the active decision-makers in different areas related to agriculture and allied activities. Studies’ relating to the extent of participation of farm women in decision-making in various home and farm aspects in different parts of the country reveals, that women play significant role in matters of home improvement, agricultural marketing, seed storage, care of animals, selection of seed (Badigar and Rao 1980, Gupta et al. 1999, Saikia 1999). The roles of males and females should be generally complementary, not only in physical participation at farm and home-related activities,
ABSTRACT The effects of indole-3-butyric acid (IBA) concentrations and three growth conditions of cutting (open area, under partial shade and under low cost polyhouse) on root performance of Citrus aurantifolia (Swingle) were investigated during March 2007 to Oct 2009. The cuttings treated with IBA @ 500 ppm, performed the best, as far as the success rate is concerned while, planting the cuttings in open area was effective in increasing the success rate of the cuttings. The vegetative growth was recorded to be the highest in the cuttings planted under polyhouse conditions. The greatest sprouted bud (68.50%) was obtained in 500 ppm followed by 1000 ppm (53.67%), while lowest (36.55%) occurred in control. Therefore it concludes that 500 ppm of IBA with open area conditions is recommended for the vegetative propagation through semi-hardwood cuttings of kagzi-lime.

KEYWORDS Kagzi lime, vegetative propagation, indole-3 butyric acid, Garhwal Himalaya

INTRODUCTION

Kagzi lime, which belongs to family Rutaceae, is one of the most important citrus fruits grown throughout the world. Besides having high nutritional value and table purpose use, kagzi lime is extensively used as rootstock for malta and santra (Souci 2000 et al. and Babu 2001). Commercially, kagzi lime is propagated through seeds, but there is a problem of non-uniformity of progeny by this method. The second most common method of propagation of lime is through semi-hardwood cuttings, but in this method the survival percentage and success rate is less under ordinary field conditions. Under these circumstances, the use of growth regulators and slight modifications of growing conditions could lead to an increase in the success rate during the propagation of kagzi lime by cuttings. Various early workers have reported that effect of IBA on bud sprouting on different Citrus species. Non-significant effect of IBA on the rooting of soft-wood cuttings of kagzi lime (Citrus aurantifolia Swingle) was observed by Singh (1959), while, Bajwa et al. (1977) noticed that the cuttings of sweet lime treated with IBA, sprouted better than untreated ones. Adventitious root formation and survivility has a lot of commercial interests because there are many plant species cutting that are difficult to root. In some plant species, adventitious root formation initiate without any treatment, while others required different growth regulators usually auxin (Syros et al. 2004). Auxin induces root formation by breaking root apical dominance induced by cytokinin (Cline 2000). Although, there is a lot of work done on different aspects of propagation of citrus fruits but the availability of literature on the use of auxins alongwith the modification of growing conditions under valley areas of Uttarakhand is scanty in the literature. The present investigation was therefore undertaken to study the effect of IBA and modified growing conditions on the success rate and vegetative growth characteristics of kagzi lime cuttings under valley conditions of Garhwal Himalaya.

MATERIALS AND METHODS

The experiment was carried out at the Horticulture Research Centre (HRC), at Chauras Campus of HNB Garhwal University, Srinagar (Garhwal). Geographically the experimental site is lying between 30°122 to 30°132...
ABSTRACT
Entrepreneurial activities are plenty and scope unlimited but durrie weaving has been identified as lucrative cottage level enterprise for rural people who have concept of good designing. A benchmark survey was conducted in three districts of Rajasthan namely Tonk, Dausa and Jaipur. Information regarding the existing practices of durrie weaving, availability and type of yarn, type of weaves, cost of looms and its marketing strategy were collected through well structured questionnaire. The results revealed that all the respondents wove durrie for commercial purpose. Majority of respondents (54%) said that durrie weaving was their family occupation. 79% respondents learnt durrie weaving from weaving units at the age of 15-25 years. Yarns were always purchased from local markets. The results also showed that 100% respondents used cotton, (27%) jute and (40-50%) wool yarns for durrie. Results revealed that 92-100% respondents used simple adda loom for weaving in all the three districts. Most of the times looms were constructed by local carpenters as it was economical. 68.9% respondents weave geometrical design. 86-94% respondents produced durries on order. Most of the respondents (79%) adopted this art to earn their livelihood and 14 % wanted to supplement the family income.50% of respondents opined that durrie weaving gave assured income. It can thus be concluded that the durrie weaving in Rajasthan is a cottage industry scattered over all the nook and corners of the state with large number of weavers depending on it to eke out their livelihood. In other hand durrie weaving craft will also help in improving the professional skills of weaver, promotes marketing technology and developing entrepreneurship amongst the rural entrepreneurs.

KEYWORDS Durrie weaving, rural entrepreneurs, loom, yarn, cotton, wool, Rajasthan

INTRODUCTION
In a developing economy like India, small scale village and cottage industries, like handlooms and cottage craft seems to have played a pivotal role in improving social and economic status of our society. They provide immediate large scale employment opportunities. Folk arts and craft are an integral part of life in India. Rajasthan, popularly called as the ‘Treasure trove of Indian handicraft’, has been able to preserve its craft despite several ups and downs. Almost every craft is produced and marketed in Rajasthan. For example, jewellery, painting, furniture, painted textiles or floor-coverings, carpets and durrie. Durrie is pile less cotton spread usually woven in simple stripes of different colours, running its own length or broken into rectilinear sections or in a single colour (Shankar 2003). Durries are not only found in village homes, but they snugly fit into the setting of a modern home. The strong appeal of the durrie arises from its wonderful use of colour and its simplicity of design. Thus it is marvelously versatile and a wealth of possibilities. It has changed the economic face of entire villages and has revived a moribund cottage industry. It is familiar object in almost every house in the villages of Rajasthan. The members of family learn to weave durries at a very young age but the practices vary from district to district. Jodhpur (Salawas), Jaipur (Badwa) and Nagour (Tankla), Tonk, Bikaner, Bhilwara, Ajmer are famous as a cottage industry belt for manufacturing of durries which has various outlets at home and abroad. Very little work has been done on the
Effect of sowing time and weed management practices on direct seeded unpuddled rice (*Oryza sativa* L.)

JITENDRA KUMAR • DHEER SINGH • BRIJPAL SINGH

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ABSTRACT Three sowing dates viz. 05 June, 20 June and 05 July and five weed management practices viz. pendimethalin 1.5 kg ha\(^{-1}\) (PE), pendimethalin 1.0 kg ha\(^{-1}\) + anilophos 0.4 kg ha\(^{-1}\) (PE), fenoxaprop-p-ethyl 0.06 kg ha\(^{-1}\) (15 DAS) followed by 2,4-D 0.5 kg ha\(^{-1}\) (30 DAS), anilophos 0.4 kg ha\(^{-1}\) (10 DAS) and two hand weedings (20 and 40 DAS) with weed free and weedy check treatments were evaluated in direct seeded unpuddled rice at crop research centre, G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand, during kharif season of 2006 and 2007. Highest grain yield (2488.5 kg ha\(^{-1}\) during 2006 and 2703.3 kg ha\(^{-1}\) during 2007) was recorded from 20 June sown rice crop which was significantly higher over rest two dates of sowing (05 June and 05 July) in both the years. All weed control treatments caused significantly higher grain yield over non-weeded control in both the years. The grain yield was highest in mechanical two weedings at 20 and 40 DAS (3324.2 kg ha\(^{-1}\) during 2006 and 3436.6 kg ha\(^{-1}\) during 2007) being significantly superior over rest of the treatments. Pendimethalin @ 1.0 kg ha\(^{-1}\) + anilophos @ 0.4 kg ha\(^{-1}\) (pre-emergence) produced significantly higher grain yield (3096.6 kg ha\(^{-1}\) during 2006 and 3288.8 kg ha\(^{-1}\) during 2007) over rest of the herbicidal treatments. Due to less number and dry matter of weeds resulting in better crop growth, reflecting in higher grain yield and economic return in both the years. Reduction in grain yield of rice due to uncontrolled weeds in weedy plots was recorded 70.4 % during 2006 and 67.4 % during 2007.

KEYWORDS Direct seeded rice, weed management, sowing dates, unpuddled

INTRODUCTION

The area under direct seeded rice is fast increasing in India mainly due to acute scarcity of water and high cost of labour. Though direct seeded rice yield comparably with the transplanted crop, increased weed infestation is major drawback of this system. Success of direct seeded rice depends largely on effective weed control especially with chemical methods. Singh et al. (2005). The yield loss due to weeds is high as 40-100 % in direct seeded rice (Choubey et al. 2001). However, the magnitude of loss in yield in direct seeded rice depends upon the density of weeds, type of weed species and duration of presence of weeds. Though hand weeding was found to be effective, yet it is very expensive. Moreover, heavy demand of labour during peak period and its scarcity necessitates the use of alternative method of weed control. Chemical weed control being cost effective and less labour dependent is recommended to overcome this constraint under direct seeded rice. Broad spectrum of weed flora may not be control led by herbicide alone, as flushes of weeds come up at different stages. Among the controllable components of environment, sowing time is a non-monetary input, but greatly affects the productivity of rice. Several studies have shown that late sowing of rice (after onset of monsoon) gave higher grain yield due to less infestation of weeds. However, very late sowing upto some extent could reduce the vegetative and reproductive growth period of rice, resulting into low crop yield. In view of the above the, the present investigation was under taken to study the effectiveness of date of sowing and weed management practices on direct seeded unpuddled rice (*Oryza sativa* L.).
Seasonal variations in leaf macro and micronutrient composition of plum cv. Santa Rosa

MK SHARMA • HU REHMAN • FA BANDAY

ABSTRACT Seasonal variations in leaf nutrient composition of plum cv. Santa Rosa were studied at 15 days interval, starting from May 1 to September 1, 2009-10. The results revealed that the variations in leaf nutrient contents occurred throughout the growing season. Leaf content of N and K increased early in the growing season, reach highest value on June 15, and thereafter decreased significantly with the advancement in growing season. Leaf P and Zn contents exhibited a decreasing trend throughout the growing period. Whereas, Ca, Mg and Fe content followed reverse trend and increased throughout the growing season. However, Cu content of plum leaves increased in the beginning of the sampling period, reached a highest value on June 15 and declined thereafter and reached its lowest value on September 1. A nutrient stability period from June 15 to July 15 was for N, P, K and Ca and between July 1 to July 15 for Zn and Cu. whereas, for Mg and Fe, nutrient stability period was observed between June 1 to June 15 and August 1 to August 15, respectively. These nutrient stability periods can be used to sample leaves for diagnostic purpose.

KEYWORDS Plum, macronutrients, micronutrients, diagnosis

Plum (Prunus salicina) ranks next to the peaches in economic importance among all stone fruits. In Jammu and Kashmir state, plum is grown in an area of 4085 hectares with annual production of 7687 tonnes (Anon 2010). ‘Santa Rosa’ is the most commercial and desirable variety of plum grown in Jammu and Kashmir state. As supplying the nutrient need to the tree crops is critical to achieve consistent production and high quality fruits, the determination of nutritional needs for efficient production of high quality fruits is an important aspect of nutrient management for the orchardists.

Among various approaches, leaf analysis has proved to be the best for formation of proper fertilizer scheduling and give accurate guidelines than soil analysis for predicting nutrient needs of fruit trees (Sparks 1984). There is positive correlation between nutrients applied, composition of leaf and production. Moreover, nutrient status of the tissue is not static and exhibits periodical changes due to the season in conjunction with other factors (Aerts 1996). Seasonal variation in nutrient composition must be considered while standardizing leaf sampling techniques and no such study has been carried out in plum for this in Kashmir valley. Therefore, the experiment was conducted to study the seasonal variation in leaf nutrient contents of plum and to assess the levels of different leaf nutrient elements during different developmental stages.

The present investigation was carried out in the Experimental Orchard of Division of Pomology, Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Shalimar, Srinagar, Jammu and Kashmir during the year 2009-10. Bearing trees of uniform age and vigour of plum cv. Santa Rosa were selected for investigation. The mid-shoot leaves of current season growth were collected at 15 days interval viz. 1st and 15th of each month, starting from May 1 to September 1. Each sample consisted of fifty leaflets along with petiole from all compass sides of the selected trees.

The leaves were collected in perforated paper bags and brought to the laboratory. The leaf samples were
Standardization of seed hydro-priming time for rice (*Oryza sativa* L.)

BIRENDRAPRASAD • SHAMBOO PRASAD

Received: December 12, 2010; Revised: March 01, 2011; Accepted: March 05, 2011

ABSTRACT Hydro-priming times were standardized for seed invigoration in rice (*Oryza sativa* L.) by evaluating the germination and seedling vigour. The seeds were soaked for 8, 16, 24, 32, 40, 48, 56, 64 and 72 hours each in aerated tap water. All the seed treatments resulted in enhancement of the seed germination at both first and final count, and seedling vigour with respect to seedling length, fresh and dry weight of seedling, vigour index (I&II), relative growth index (RGI) and mean daily germination (MDG) for rice except seeds hydro-priming for 64 and 72 hours. The seed germination and seedling vigour increased as the hydro-priming time increased up to 48 hours. The maximum seed vigour enhancement was achieved with hydro-primed for 48 hours, followed by that of 40 hours in all the parameters studied.

KEYWORDS Hydro-priming, time, rice seed, invigoration

Rice (*Oryza sativa* L.) is the most important staple food for about half of the human race. Poor seedling establishment is one of the major yield limiting constraints both transplanted and direct seeded rice especially under stressful conditions. Rapid and uniform crop stand is a prerequisite for better yield and quality produce. If seed germinate erratically over long time, seedling growth will not uniform and plants will mature over a wider period. Seed germination enhancement technologies based on pre-sowing seed hydration i.e. priming can be a solution of this problem. The term priming is a process in which seeds are imbied either in water or osmotic solution or a combination of solid matrix and water in specific proportions followed by drying before radicle emergence. In hydro-priming seeds are soaked in well aerated water and dried before sowing to accomplish seed hydration. Hydro-priming in wheat for 24 h resulted in increased grain yield (Kahlon et al. 1992), where as it increased the speed of seedling emergence alongwith field stand and plant growth in *Phaseolus vulgaris* (Kazem et al. 2010). Since, a lot of works have been conducted on hydro-priming, results on the benefits associated with hydro-priming time are missing and no comprehensive study has been made, although farmers have been adopted traditional soaking (8 to 72 hours) before sowing the rice in nursery since decades. Therefore, the present investigation was executed to standardize the hydro-priming time for better rice seed invigoration.

The study was carried out during 2010 at GBPUA&T, Hill Campus, Ranichauri, Tehri Garhwal, Uttarakhand, India. The seeds of local rice cultivar Lal Dhan was obtained from District Agriculture Officer, District Uttarkashi, Uttarakhand, India and used for present study to standardized the hydro-priming time for better rice seed invigoration. The initial seed moisture content was 9.1 (dry weight basis %), determined by high temperature oven method at 139±2°C for 4 h. For hydro-priming 200g weighed quantity of seeds was soaked in aerated tap water at 25±2°C (Farooq et al. 2006) for 8, 16, 24, 32, 40, 48, 56, 64 and 72 h followed by drying to initial moisture under shade. Dried primed seeds were packaged in polythene bags and stored at room temperature for further use. The experiment was laid out in Completely Randomized Design with four replications of each treatment. 100 seeds of each replication of each treatment were placed separately in pre-sterilized Petri-dishes with two fold filter paper at the bottom. The Petri dishes were placed in an incubator at 25°C. The germination was counted daily for 14th days. Germination % at first and final count were recorded on 5th and 14th day respectively. Seedling length and fresh weight of twenty randomly
Seed germination and seedling performance of *Rubus ellipticus* (Smith) as influenced by various pre-treatments

JMS RAWAT, VIDYAVATI RAWAT, YK TOMAR

Received: Oct 15, 2010; Revised: February 14, 2011; Accepted: February 16, 2011

**ABSTRACT** Seeds of *Rubus ellipticus* (Smith) possess seed coat dormancy which hamper, rapid and uniform germination. To overcome this dormancy, seeds of this species were pre-treated. All pretreatments improved the germination capacity of seeds. The highest (78.33%) germination being after soaking in water at room temperature for 48 hrs. Soaking seeds in water for 24 hrs at room temperature resulted in maximum radicle length and root dry weight, whereas, increased shoot length (5.18 cm), root length (23.78), number of leaves (10.22) and survival (55.56%) of seedling was associated with water soaking at room for 48 hrs.

**KEYWORDS** Rubus ellipticus, dormancy, germination, soaking, survival

*Rubus ellipticus* (Smith), yellow raspberry (wild raspberry, family Rosaceae), is a deciduous perennial locally known as ‘Hisalu’ in Garhwal and Kumaun regions of Uttarakhand and believed to be originated from the Himalaya (Bailey, 1953). In India, it is commonly found throughout Himalaya from Jammu and Kashmir to Assam at about 650 to 2200 m altitudes extending to Western Ghats and Deccan (Hooker, 1879). About 50 species of *Rubus* are known to occur in temperate and subtropical parts of India. Of the wild edible species, the most important ones are *R. ellipticus*, *R. moluccanus* and *R. niveus* (Arora and Pandey 1996). This is an important species as it also helps in maintaining the bearing capacity of the earth by improving the ecological balance and saving the atmosphere from various pollutions.

The tasty *Rubus ellipticus*, growing in abundance in this region is an evergreen shrub, with juicy fruits that contain very high percentage of extractable juice. There is virtually no cultivation cost involved, and it is a good source of extra income for farmers. These fruits are particularly rich in Vitamin C (38 mg per 100 g of edible portion), with a high content of calcium (22 mg). The fruit is eaten raw or dried or preserved, used for preparing jam and offered for sale also. Juice can be preserved or used for squash making besides use of other plant parts as fodder and fuel. Its blossoms are used for medicinal purposes as an eye ointment or to soothe stomach ailments. The juice of the root is used in the treatment of fevers, gastric troubles, diarrhoea and dysentery. The leaf buds, combined with *Centella asiatica* and *Cynodon dactylon*, are powdered to a juice and used in the treatment of peptic ulcers (Manandhar 2002). A renal tonic and antidiuretic, it is used in the treatment of weakening of the senses, vaginal/seminal discharge, polyuria and micturation during sleep (Tsarong 1994).

Propagation is mainly done through tip layers, root suckers and root cuttings. *Rubus* seeds have a hard impermeable seed coat and require some kind of pretreatments to break seed coat dormancy for better germination. Thus, the present research work attempts to formulate effective and practical pretreatments to enhance seed germination and achieve better seedling growth.

Ripe fruits of *Rubus ellipticus* (Smith) were collected in the month of April, 2003 and 2004 from its natural habitats in Rudraparyag district of Uttarakhand. After collection, seeds were depulped by washing with water. Only those seeds which sank in water were taken, dried in the shade and stored in cotton bags till further experiments.

To test the effect of hot water on breaking seed coat-imposed dormancy, 300 ml of water was first heated up to 80°C and taken away from the heat source. Seeds were immersed in the hot water and left in the water for 24 and
Response of tomato to irrigation and fertilizer management practices

UDAY SHARMA

ABSTRACT The experiment was conducted to study the effect of different irrigation and fertilizer management systems on plant growth and yield of tomato, during 2005 and 2006 with three different management systems and six fertilizer levels and sources. The data on plant growth parameters shows that drip fertigation with 150% recommended fertilizer doses and FYM application to soil resulted in maximum shoot growth. The fruit parameters were found to be influenced positively by flood irrigation and soil application of fertilizers. But, the ultimate objective of yield maximization was achieved with drip fertigation taking 100% recommended doses of fertilizers and adding FYM to the soil. The yield levels were drastically reduced with flood irrigation treatments especially when only farm yard manure, double the quantity recommended, was added to the soil minus chemical fertilizers. The use of fertigation systems and integrated use of organics was found to have a combined effect on the yield maximization of tomato while maintaining soil fertility and achieving the goals of reducing nutrient losses for environmental safety.

KEYWORDS Yield, plant growth, fertigation, tomato

Tomato (Lycopersicon esculentum Mill.) is one of the most remunerative crops grown in the mid hill regions of Himachal Pradesh and occupies an area of 9.6 thousand ha with a total production of about 336.3 thousand tonnes (NHB 2010). It is a summer season crop in Himachal Pradesh and fetches premium prices in the national market due to its availability during the off-season in the plains. The introduction and adoption of high yielding hybrids requires special emphasis on soil and fertilizer management. Irrigation and fertilizers play an important role in determining the yield and quality traits of any crop. Intensive cultivation coupled with use of unbalanced and inadequate fertilizers accompanied with restricted use of organic manures and biofertilizers have made the soils not only deficient in the nutrients, but also deteriorated the soil health which ultimately reflects in the declining yield levels. Under such a situation the integrated use of chemical fertilizers along with organic manures and biofertilizers has assumed a great significance for the maintenance of soil productivity. Therefore, suitable combinations for an IPNS module need to be developed. Irrigation is another important component for crop production and in the hill states in the absence of assured irrigation, technologies need to be developed for efficient utilization of the available irrigation water.

Drip irrigation has proved its superiority over other conventional methods due to its precise and direct application of water in the root zone. Fertigation results effectively in increasing both water and nutrient efficiency when correctly applied. Youssef (2001) found that organic manure (25%) and chemical fertilizers (75%) were best in producing maximum yields as well as fruit total soluble solids, whereas, higher organic matter treatments improved the fruit characteristics like fruit diameter, fruit length and fruit flesh thickness. The studies of Patel and Rajput (2003) showed that fertigation reduced the fertilizer requirements of the crop by 40% as compared to broadcasting without significantly affecting the yields. The application of 100% of the recommended fertilizer rates through fertigation resulted in overall yield increase by 18.5, 16.0, 18.4, and 10.0% in okra, tomato, onion, and broccoli, respectively.

The drip fertigation with 100% recommended NPK increased growth parameters as well as yield under Rajasthan situations and also enhanced the quality characters like TSS, titratable acidity, ascorbic acid content, fruit weight etc. as compared to conventional methods (Rana et al. 2005). Fertigation, besides improving...
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CORRIGENDUM

There was a mistake left in the authors names in a paper published in Journal of Hill Agriculture 2010 Vol 1(2) at pages 190-192. The correct names of the authors of the paper may please be read as “KS THAKUR, RAJNEESH THAKUR, YR SHUKLA, DK MEHTA, AK THAKUR”.

The society shall recognize excellence in scientific research and development by conferring various awards to suitable life members.

1. Fellows will be nominated / selected from among those who have been Life Members of the society and based on their contributions for the society and / or his / her overall professional achievements.

2. Nominations for fellowship shall be made by fellows of the Society and / or Executive Council. Fellows will be inducted after evaluation of their R&D contributions as per guidelines to be prescribed by the Executive Council of the Society.

3. Life members of the society up to the age of 65 years will only be eligible for induction and continuation as fellows of the society.

4. The maximum number of Fellows at any time shall not exceed 200. Each year a maximum of 6 Fellows (excluding recipients of the awards made by Indian Society of Hill Agriculture) may be selected from among various sub-disciplines in agriculture and allied sciences i.e.

   a. **Plant Improvement** with reference to genetics, plant breeding, production, cytogenetics, physiology, biotechnology and biochemistry of various crops including fruits, vegetables, flowers, medicinal plants and forest plants.

   b. **Plant Protection** including entomology, plant pathology, nematology, microbiology and agro-chemicals


   d. **Animal Sciences** including Veterinary Science and Fishery

   e. **Agricultural Engineering** including Farm machinery, Soil & Water Conservation Engineering, Energy Management, Postharvest Technology, Food Technology and Dairy Processing

   f. **Social Sciences** including Statistics, Economics, Extension, Home Sciences, Nutrition, Research Management

**Types of Awards**

The following awards shall be given annually

I. **LIFE TIME ACHIEVEMENT AWARD**

This award shall be given each year for an eminent individual scientist who has made a remarkable contribution for the development of agriculture especially in the hills as evidenced by publications in scientific journals of repute/products and technologies developed etc. The awardees for Life Time Achievement Award shall be selected and nominated by the Executive Council of the Society. Each award shall consist of a citation and a Momento.

II. **RECOGNITION AWARD**

These awards shall be given for significant contributions to the advancement of knowledge/technologies in the relevant scientific disciplines of the particular area of hill agriculture. The research contributions should be based on work carried out preferably in hills, as evidenced by publications in scientific journals of repute/products and technologies developed. The period of assessing the contributions shall be up to the year of nomination. The awards shall be made to distinguished scientists, in the age group of > 40 years, who are Fellows of Indian Society of Hill Agriculture in the above six sub-disciplines of agriculture. Each award shall consist of a citation and a Momento.

III. **YOUNG SCIENTISTS AWARD**

Young Scientists awards shall be initiated with primary objective of distinguishing young scientists of promise and creativity through their contributions to agricultural sciences after obtaining Ph.D. degree. Scientists below the age of 40 years are eligible for this award. There will be six awards, one in the above six sub-disciplines of agriculture. Each award shall consist of a citation and a Momento.

IV. **BEST STUDENT AWARD**

The Best Student Award shall be given to students having excellent academic record right from matric to Master’s level supplemented by good quality postgraduate research work. The maximum age of eligibility for this award shall be 25 years. Each award shall consist of a certificate and a momento.

V. **BEST PAPER AWARD**

The Best Paper Award shall be given to the best quality research paper of real significance and value to the development of agriculture in hills published in the year of consideration in Journal of Hill Agriculture. All the published papers shall be scrutinized by a committee constituted by the Executive Council for the purpose. Each award shall consist of a certificate and a citation.

The Executive Council may also decide to give cash prizes to the awardees based on the availability of funds in the society and to alter the number and types of categories of Fellowships and awards each year. The society also encourages sponsored medals and awards to students, scientists, teachers in recognition of their services and achievements. Society wish more sponsors to come forward for the same. The Year for consideration of all fellowships and awards shall be from 1st January to 31st December of a particular year.
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9. Category of membership (please tick)
   - Life member
   - Annual member
   - Organization/ Subscriber member

10. Payment of membership fee in (Rs) ................................................. By cash/ Demand Draft
    No. ........................................... dated: ................................................ in favour of Indian Society of Hill Agriculture payable at Chamba, Distt Tehri-Garhwal, Uttarakhand, India

Note: Interested members may send their demand drafts by registered post only. Drafts sent by ordinary post are liable to be lost during postage.

DECLARATION

I wish to become the life/ annual/ subscriber member of the Indian Society of Hill Agriculture and if enrolled agree to abide by the rules and regulations of the society.

Date: ................................................................. Signature: ......................................................
Place: ................................................................. Name: (......................................................)
MEMBERSHIP OF INDIAN SOCIETY OF HILL AGRICULTURE

Membership of the society shall be open to individuals from all nations and shall consists of the following categories of members with qualifying criteria as indicated against each. Membership can be obtained by filling a membership form and sending it to editorinchiefjha@gmail.com along with membership fee as detailed ahead.

(i) Ordinary Members (Annual Membership)
This membership shall be offered to the individuals interested in promotion of Hill Agriculture and its allied branches. This shall also be the minimum fee to be deposited per author for getting a paper published, in case it is accepted for publication. There shall be an annual fee of Rs. 500/- for individuals from all SAARC countries including India and US $ 30 for individuals from rest of the nations. Year shall be counted w.e.f. January 1 to December 31 of each year. If somebody deposits fee in October 2010 it shall be counted only for that year i.e. 2010.

(ii) Life Members (Continuing Membership)
There shall be a one time life membership fee Rs. 3000/- for individuals from all SAARC countries including India and US $ 200 for individuals from rest of the nations. (iii) Patrons (Continuing Membership)
Any individual or institution making a payment of a substantial sum (as may be prescribed by the Executive Council from time to time).

(iv) Subscribers
Any corporate body / institution / library / association of persons can subscribe Journal of Hill Agriculture by making an annual payment of Rs. 1500/- for all SAARC countries including India and US $ 100 for rest of the nations.

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The membership fee can be deposited by any of the two methods as detailed below:

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The above revised fee of ISHA membership shall be applicable w.e.f. 1st January, 2011

(Satish Kumar Sharma)
Editor-in-Chief, JHA
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