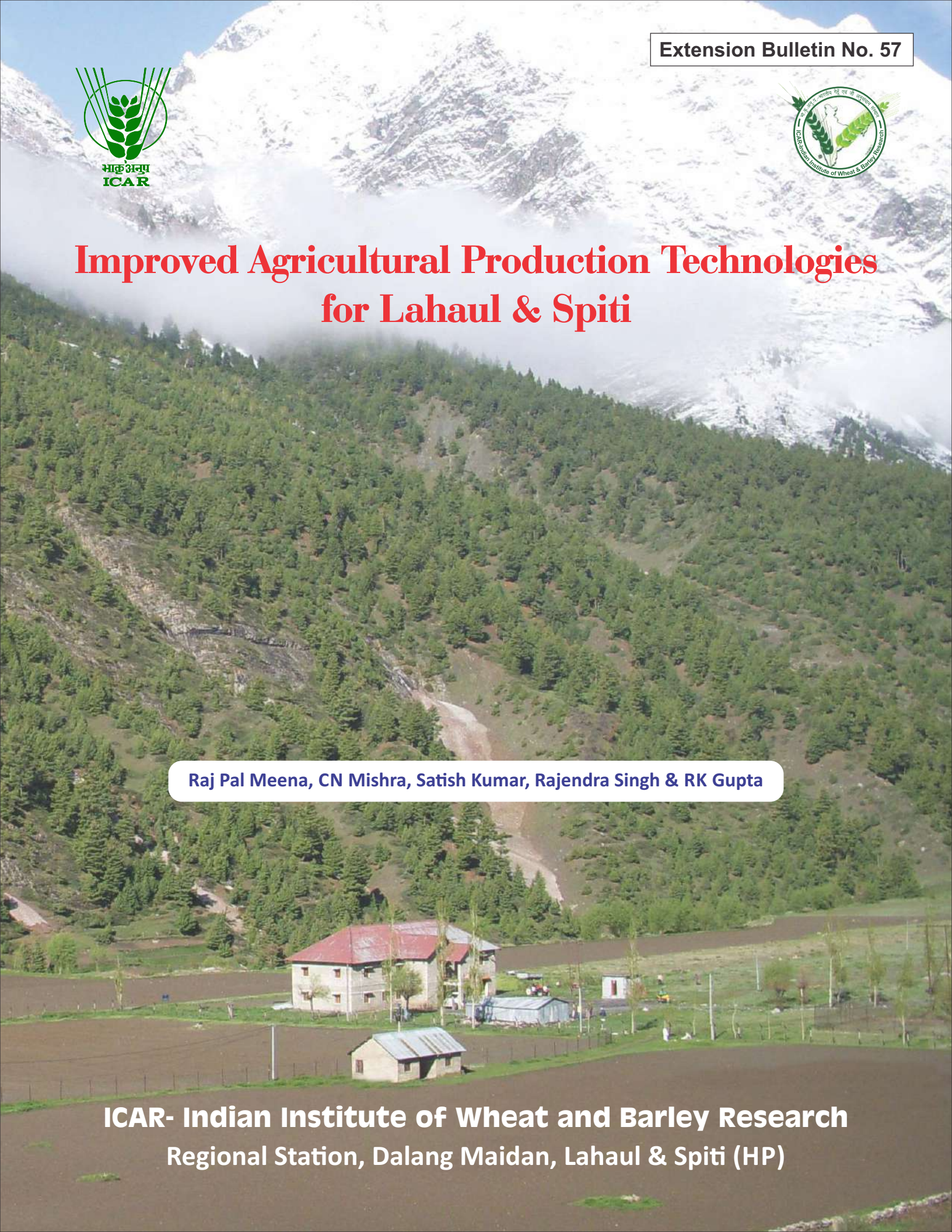
Extension Bulletin No. 57

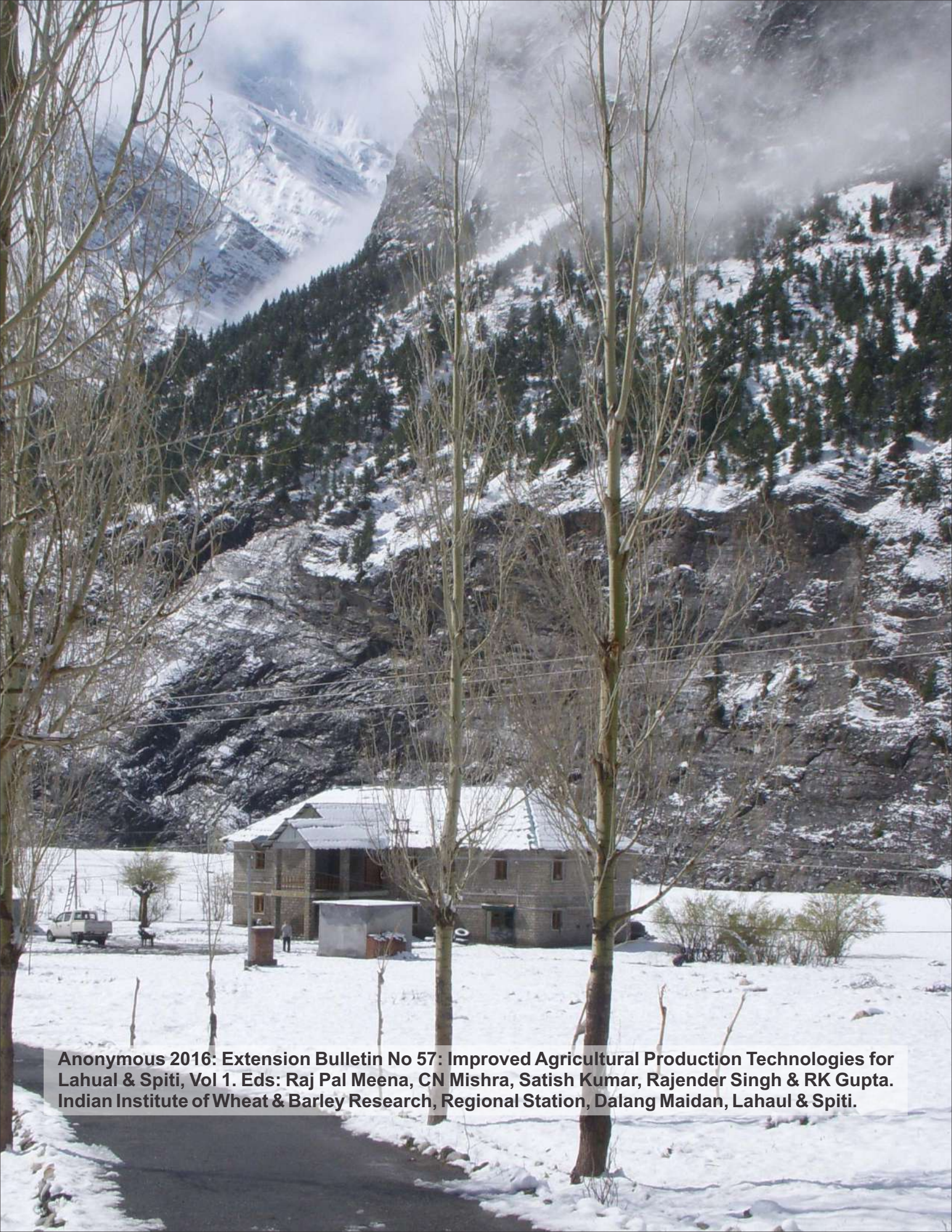
Improved Agricultural Production Technologies for Lahaul & Spiti

Raj Pal Meena, CN Mishra, Satish Kumar, Rajendra Singh & RK Gupta



ICAR- Indian Institute of Wheat and Barley Research

Regional Station, Dalang Maidan, Lahaul & Spiti (HP)



Anonymous 2016: Extension Bulletin No 57: Improved Agricultural Production Technologies for Lahual & Spiti, Vol 1. Eds: Raj Pal Meena, CN Mishra, Satish Kumar, Rajender Singh & RK Gupta. Indian Institute of Wheat & Barley Research, Regional Station, Dalang Maidan, Lahaul & Spiti.

Seed Potato Production In Lahaul Valley

Dhurv Kumar
ICAR-Central Potato Research Institute, RS, Merrut

Potato is an important cash crop in the Lahaul valley of Himachal Pradesh. Being grown during the off-season, potato from Lahaul valley fetches a premium price in the market, thus ensuring high returns to the farmers of the region. Potato produced in the hills is available to the consumers as fresh potatoes during the summer, rainy and early autumn seasons. Potato is grown under long day condition in Lahaul valley even then potato productivity in this region is quite low at 14.0 t/ha as compared to national average of more than 19 tons per hectare. Lack of technical know-how, non availability of good quality seed and other inputs, subsistence nature of farming and cultivation of potato are the main contributing factors for low productivity. Seed potatoes cultivation is different than table/processing potatoes cultivation and has some additional operations.

Timely planting: Timely planting is very much essential for seed potato crop, so the crop must be planted during second fortnight of April.

Planting of good quality whole seed tubers: The seed used should be free from viral, fungal, bacterial diseases and nematodes. Pre-sprouted, optimum sized (40-80g), whole tubers should be planted spaced at 60 × 20 cm.

Varieties: Kufri Himalini, Kufri Giridhari, Kufri Himsona, Kufri Jyoti and Kufri Chandramukhi are suitable for this region.

Nutrient management: Lower doses of nitrogen and potassium should be applied in seed potato crop in comparison of table potato crop. Higher dose of nitrogen will mask the virus symptoms on the leaves, hindering the rouging of virus infected plants, while higher dose of potassium increases the size of progeny tubers, which are not desirable for seed purpose. In seed crop 120 kg N, 100 kg P_2O_5 and 100 kg K_2O per hectare is recommended. Half dose of N and full dose of P and K should be applied at the time of planting and remaining half dose of N should be applied at earthing-up (40 – 45 days after planting).

Weed Management: In seed potato crop chemical weed management is better over hand weeding to avoid spread of contagious viruses due to manual activities. For weed control pre-emergence spray of metribuzin @ 500g *a.i.*/ha or spray of Bentazone @ 250g *a.i.*/ha at 35-40 days after planting are recommended.

Water management: Care must be taken at critical stages viz. stole formation, tuber initiation and tubers bulking stages. Irrigation should be withheld 7-10 days before haulms killing.

Plant protection: Systematic granular insecticides such as Forate 10-G should be applied at earthing-up against sucking insects and white grubs. One prophylactic spray of mancozeb (Dithane M-45) @ 2.5kg/ha should be given at full canopy development, while spray of symoxanil 8% + mancozeb 64% (Curzate MZ / Moximate) @ 3 kg/ha must be applied when late blight is observed in any

field of the area. Spray of symoxanil based fungicide can be repeated after 8-10 days as per need. If any sucking insect like aphids, white flies observed in the field then the spray of Imidachloprid @ 400ml/ha must be applied against spread of viral diseases.

Rouging: It is the key operation in seed potato production, quality of seed is depends on the time and frequency of rouging. Seed crop should be inspected 3 times at 50, 65 and 80 days after planting during growing season to remove the off type, diseased and abnormal plants.

Haulms killing: Haulms cutting/killing must be done 10-12 days before harvesting, so that skin of the tubers could mature/harden properly.

Harvesting, grading and seed treatment: Curing of the produce is done by keeping in heaps in a cool shady place for about 15 -20 days. Cut, cracked and de-shaped tubers must be separated out from the produce and then produce must be graded according to size. Seed tubers should be treated either with commercial grade 3% boric acid solution for 10 minutes or with monceren to prevent surface borne diseases. After treatment seed must be dried properly in shade and then filled in bags, labelled properly and keep in storage/cold storage for use as seed material during next crop season.

Pest Management In Willow Tree Of Lahaul Valley

Kishore Khosla And K.S. Pant
Dr. Ys Parmar University Of Horticulture And Forestry, Solan

Willow plantation was found drying on a large scale in the valley. There were wide stretches of dried willow tree especially in Sissoo, Gondhla, Tandi, Kargha and Keylong and adjoining areas. Unlike the tree trunk, branches were severely affected having cankerous lesions (3-15cm) at emergence point of branches. A large number of branches were seen dried resembling die-back symptoms as a result of girdling due to canker. The affected part was depressed, somewhat flattened, light brown to dark brown with raised edges

(callus) and split bark. The severely cut/lopped and water stressed trees were found more affected than the trees near water channels or in the irrigated area. The microscopic studies of the associated pathogen from the cankerous lesions of diseased samples drawn during the years 2001, 2003 and 2007 from the affected plants have consistently revealed the association of *Cytospora chrysosperma* Pers. Ex. Fr. fungus. In addition to it, the trees were also found severely infested with white scale insects. The association of the sap sucking insects (scale and aphid) and water stress may have rendered the plants vulnerable to the attack of the *Cytospora* fungus. Moreover, the injuries inflicted as a result of unscientific cutting/ lopping of the trees have further aggravated the situation as the associated fungus is otherwise a weak pathogen which attacks stressed/weakened plants and requires injuries for infection.

The observations gathered from time to time since 1999 conclusively revealed that water stress, change in weather conditions, ageing of the trees, nutrient depletion, infestation of sucking insects and injuries inflicted as a result of improper cutting/lopping of the trees have rendered the willow plantation weak and vulnerable to the attack of the *Cytospora* fungus. The ultimate drying of the trees is conclusively due to the attack of this fungus causing cankers and girdling of the branches/shoots.

With the changing environment scenario farmers were advised to use improved management practices like lopping of fully crown tree, used disease free saplings plants. Plant Single seedling in place of three saplings in a pit and also used improved clones of willow developed by the Dr. Y.S Parmar UHF –Nauni, Solan:

- In addition to this farmers were also advised to plant other fodder species like higher altitude Mulbrery (*Morus laevigata*)
- Planting trees in good/deep soil on a proper site.
- Water stress to the plants should be avoided and adequate moisture in the root zone may be maintained through adequate irrigation.
- Avoid excessive lopping or pruning of bigger branches.
- Bark of the young planted seedling/ cutting should be protected from animal damage.
- Select only healthy sticks for plantation purpose which are free from canker and scale infestation.
- Uprooting of poor stock and replacement with superior clones developed by Dr. Y S Parmar University of Horticulture and Forestry, Nauni-Solan.
- Creating awareness for proper planting stock among the growers. Since *Jungli beli* (wild willow) is least affected by disease, so its potential in plantation or producing new resistant willow planting material needs further investigations.
- New plantations may be raised from the nursery raised plants i.e. the entire transplant.

Compost preparation for Organic Farming

Rameshwar, CSK Himachal Pradesh Krishi Vishwavidyalaya, Palampur

Biological decomposition process that converts organic matter to stable humus like product under controlled conditions. Compost not only improves chemical properties of soil but also physical and biological properties of soil

Vermicomposting:

- Vermicompost can be prepared by making pit of 1.5-2 feet deep, 12 feet of length and with 5 feet of its width in addition to making pucca, polylined or other structure.
- Partially decomposed material and inoculated with *matka khad* increases the worms and reduces the period of preparation by 15-20days.
- Mixing of vermicomposting material after 30 days and decreasing the height of the heap fastens the decomposition process by 15-20days
- Increasing the quantity of worms from 1kg to 2Kg/heap reduces the time of preparation of vermicompost
- Abnoxious weeds before flowering can be used for making vermicomposting
- By putting fresh dung in the pit of prepared vermicompost, the worms from the pit will shift to the fresh dung and thereafter vermicompost can be separated easily.
- Vermicompost can be enriched by adding organic inputs (Rock Phosphate, Patent Kali, Bone meal , Gypsum & through other natural resources) and with Biofertilizers etc.

General recommandation for composting

- Use of animal urine for enriching compost
- Moisture must be maintained in compost for making it more effective
- Always keep compost covered rather keeping it open

Weed Management in Vegetable Crops and Spray Technology

RS Chhokar and Raj Pal Meena
ICAR-Indian Institute of Wheat & Barley Research, Karnal

Weed infestation is one of the major biotic constraints in crop production accounting for about one third of total losses caused by all the pests. For realizing potential crop yield, proper weed management is very important. Weeds not only reduce the yield but they also reduce quality as well as make the harvesting operation difficult. Therefore for sustaining food grain production and to feed ever-increasing population weed management is very essential. Weeds compete with crop plants for moisture, nutrients, light and space thereby depriving the crops of vital inputs. The losses caused by weeds vary depending

on weed density, time of emergence, and environmental conditions. In extreme cases weeds can cause complete crop failure.

Weed control measures

The various weed management practices can be grouped into three broad categories namely cultural and preventive; physical or mechanical; and chemical weed control. These practices are discussed as under.

A. Preventive and cultural measures

- Use clean wheat seed free from weed seeds.
- Uproot weeds before seed setting
- Keep bunds and channels weed free
- Adopt closer row spacing.
- Grow competitive cultivars
- Follow stale seed bed techniques to reduce weed presure
- Following proper crop rotations can also provide some degree of weed control..

B. Mechanical Control

It involves the removal of weeds by various tools and implements including hand weeding and uprooting. Manual weeding though effective but it involves considerable amount of man-power and time. Due to costly and scarce labour its feasibility is very less. Mechanical control can be practiced effectively in wide spaced crops. Weeding with the help of adjustable hand cultivator or wheel hoe can be done in vegetable crops.

C. Chemical Weed Control

The scarce and costly contractual labour has

Table :1 Weed management in vegetable crops

Crop	Herbicide	Dose (g a.i./ha)	Time of application	Effective against weeds
Potato	Metribuzin (Sencor 70 WP)	350&400	0-3 Days after sowing or 10-15 days after sowing	Grass and broad leaf weeds
	Pendimethalin (Stomp 30 EC)	1000&1500	0-3 Days after sowing	Grass and broad leaf weeds
	Fluchloralin (Basalin 45 EC)	1000&1500	Pre Plant Incorporation	Grass and broad leaf weeds
	Isoproturon	750&1000	Before emergence	Grass and broad leaf weeds
	Metolachlor (Dual 50 EC)	750&1000	Before emergence	Grass and broad leaf weeds
	Butachlor (Machete 50 EC)	1000&1500	0-3 Days after sowing	Grass and broad leaf weeds
Cauliflower and cabbage	Fluchloralin (Basalin 45 EC)	1000	Soil incorporation before transplanting	Grass and broad leaf weeds
	Pendimethalin (Stomp 30 EC)	1000&1250	Before transplanting or after and immediately followed by irrigation	Grass and broad leaf weeds
Pea	Fluchloralin (Basalin 45 EC)	1000	Pre Plant Incorporation	Grass and broad leaf weeds
	Pendimethalin (Stomp 30 EC)	1000&1500	0-3 Days after sowing	Grass and broad leaf weeds
	Quizalofop (Targa Super 5 EC)	50	15-30 days after sowing	Grass weeds

forced the majority of farmer to adopt herbicides. The other major advantage of chemical weed control is that large area can be covered in short time with very less labour involvement.

Chemical weed control for the major crops of Lahaul and Spit

Spray Technology:

For getting desirable weed control with herbicides it is very important to follow proper spray technology. For herbicide application, manually or power operated sprayer is required. Manual operated Knap sack sprayer are mostly used for post emergence application and mostly used by small farmers on small areas. At farmer's field, poor efficacy of various herbicides are observed due to faulty spray technology. Therefore, proper spray technology is most important component to achieve good weed control results. Type of nozzles, spray tips, nozzle booms, pressure regulator and calibration of sprayer are key components of spray technology.

- The most important but usually neglected component of sprayer is nozzle. The most suited type of nozzle for uniform herbicide application is flat fan nozzle. The proper calibration of sprayer before using in field is very essential to have good weed control results.
- For efficient and accurate application of herbicides multiple nozzle booms are used. Two, three or four nozzles are fitted on a boom.
- For wider spaced crops use protected or hooded sprayers that are carried down the row middles. Nozzles mounted inside the hood spray the row middles while the hood protects the crop from direct contact of herbicide spray and drift. Non selective herbicides like Roundup or Gramoxone can be applied through hooded sprayers. Do not allow the non selective herbicides to contact stem or foliage of any crop plants.
- Use surfactants for better efficacy
- Spray the herbicides, both pre and post emergence, when there is sufficient moisture in the soil.
- Spray on clear and sunny days.
- Ensure complete coverage of the field, while spraying.
- Wear protective covering while spraying.
- Avoid spraying on a windy day and spray according to wind direction to avoid drifting.
- Keep the speed, pressure and height of the nozzle or boom constant for better efficacy.
- After mixing, spray solution should not be kept for longer time particularly when using dry formulations.
- After herbicide application, sprayer should be rinsed with clean water.

Nutrients management in vegetable crops grown in Lahaul and Spiti of HP

Subhash Chander and Raj Pal Meena
ICAR-Indian Institute of Wheat & Barley Research, Karnal

- Nutrient management is very important aspect for achieving optimum economic yield from any crop and this aspect is mainly influenced by the location specific conditions like soils, climatic conditions and crops to be grown, irrigation facilities, availability of the fertilizers, socio-economic conditions of the farmers, etc. In Lahaul Spiti the farmers are well aware and they are cultivating vegetable pea and potato during off season and fetch very high prices of these crops. The nutrient management in these crops is as under:
- In vegetable pea or Garden pea for achieving optimum green pod yield apply 20 t/ha well decomposed Farm Yard Manure (FYM) during field preparation before sowing and then also apply 25-30 kg N/ha, 40-50 kg P_2O_5/ha and 40-50 kg K_2O/ha as basal dose. Treat the vegetable pea seed with suitable *Rhizobium* and phosphorus solubilising bacteria inoculums. One packet of biofertilizers (200g) is sufficient for 8-10 kg seed. Micronutrients are applied on soil test basis. If the soils are deficient only then apply zinc, iron, copper or manganese. These nutrients can be applied as basal (at sowing time) or as 0.5 percent foliar spray (500g of $ZnSO_4$ or $FeSO_4$ or $CuSO_4$ or $MnSO_4$ in 100 litres of water and 250g unslaked lime should be added to neutralize the acidity) at 35 and 45 days after sowing.
- In Potato cultivation especially for vegetable purpose apply 20 t/ha well decomposed Farm Yard Manure (FYM) during field preparation before sowing and 2 kg each of *Azospirillum* and *Phosphobacterium* as basal and 125-150 kg N/ha, 60-70 kg P_2O_5 and 100-125 kg K_2O/ha in two splits; half as basal and the balance dose as top dressing at 30 days after sowing. Apply Magnesium sulphate at 60 kg/ha as basal dose wherever Magnesium deficiency is prevalent.

Wheat Cultivation in Lahaul Valley

Raj Pal Meena, CN Mishra, Satish Kumar & Rajender Singh

The wheat cultivation in Lahaul valley is mainly done with traditional local varieties which are low yielding and susceptible to rust diseases which could be a reason that the area under wheat cultivation from the valley has gone down drastically. Hence, introduction of improved and high yielding varieties is the need of hour, but the valley is lacking in information on recommendation of high yielding wheat genotypes and fertilizer doses for them.

To realize the profitable yield of wheat in the valley farmers are advise to use the

recommended variety for the region that is recommended varieties for very high altitude region of western himalaya. Along with high yielding varieties recommended dose of fertilizers should be applied as a part of nutrient management. The recommended dose of fertilizers 125kg N/ha, 60kg P_2O_5/ha, 30kg K_2O/ha resulted in significantly higher yield. To get the maximum benefits of externally supplied chemical fertilizers, full dose of phosphorus and potassium and 1/3 dose of nitrogen should be applied at sowing time through diammonium phosphate or NPK mixture (12:32:16) and remaining Nitrogen should be applied in two equal splits with first and second irrigations.

Weed control is an important aspect for realizing potential crop yield. Due to labour and time shortage if manual weed control is not possible, chemical weed control is an easy and affordable option available with the farmers. As pre-emergence, pendimethalin (Stomp 30 EC) can be applied @1000g/ha (3300 ml/ha) at 0-3 days after sowing in 500-750 liters of water/ha. Care should be taken to have fine tilth and good soil moisture for better performance of pendimethalin. If pre-emergence application of herbicide was not done post emergence herbicide application can be done. Post emergence herbicides are mainly applied 7-10 days after first irrigation. Some of the post emergence herbicides are Sulfosulfuron @ 22g ha (Leader 75 WG @ 33 g/ha), Clodinafop @ 60 g/ha (Topik 15 WP @ 400 g/ha), Fenoxaprop-ethyl @ 100-120 g/ha (Puma Super 10EC @ 1000-1200 g/ha), Metsulfuron @ 4 g/ha (Allgrip 20 WP @ 20 g/ha), Metribuzine @ 210-280 g/ha (Sencor 7 WP @ 300-400 g/ha).

By adopting the improved techniques like application of recommended doses of nutrients and suitable varieties much higher yield can be obtained. Wheat varieties HPW 89, VL 892, HS 240 were found the best for the Lahual Valley (HP).

First Print : March 2016
Publisher : Director, ICAR-IIWBR, Karnal
Copies : 2000

Design & Print :
SHRIKOSHI # 9812053552