

**Powdery mildew (*Erysiphe pisi*):** Infected plants are covered with a white powdery film. Symptoms first appear on the upper surfaces of the oldest leaves. Late sowing of the crop should be avoided. If powdery mildew is mild to moderate, try spraying pea plants with *neem* oil. Several fungi such as *Ampelomyces*, *Cladosporium*, *Tilletiopsis*, *Verticillium* and insects (*Thrips tabaci*) have been reported to parasitize the powdery mildew on host surface. Spray of 10% cow milk to control the disease.



**Pea wilt (*Fusarium oxysporum* f. sp. *pisi*):** The plants become stunted, pale yellow green, with leaves curled downward. The stem becomes thickened and brittle at ground level. Resistant varieties should be used to manage wilt. Avoid early sowing to escape high humidity and high temperature which are congenial for disease development. Crop should be rotated for at least 2-3 years with suitable non-leguminous crops. If the disease persists, solarize the soil before planting. To solarize the soil, put a clear plastic tarp on the soil surface for 4-6 weeks during the hottest part of the year.



**Rust of Pea (*Uromyces fabae*):** The yellow aecia appear first on the under surface of the leaves, stems and petioles. The formation of aecial stage is preceded by a slight yellowing, which gradually turns brown. All the four stages develop on every green part of the host including the pods. The teleuto-pustules occur in the same sources as the uredia and develop from the same mycelium. Follow 1-2 years of crop rotation excluding gardenpea. After harvest, the affected plant should be burnt.

#### Insect management

**Leaf miner (*Liriomyza* sp.):** It is a polyphagous pest attacking many crops. The adult is a small brown fly lays eggs on the young leaves. The grub tunnels inside the leaf and



feeds on the inner tissues of the leaves and make white serpentine lines/mines on the leaves as shown in the figure. Severe infestation leads to leaf fall. The adults can be trapped in yellow sticky traps. Infested leaves can be removed and destroyed at the initial stage of infestation.

**Pea aphid (*Acyrtosiphon pisum*):** Small greenish insects colonise specially in the growing tip and suck the sap making stunted growth to the plant. They secrete honey dew, which induces the infestation of sooty moulds and causes blackening of leaves.



Coccinellids (lady bird beetles) feed voraciously on the aphids. Predators like *Chrysoperla* sp. are also good predators of aphids. Spray of *neem* seed kernel extract 5% is reported effective against aphids.

**Pod borer (*Helicoverpa armigera*):** Larva usually feeds by making circular bore holes on fruits. The larva remains partly out of the fruit hole while feeding. Planting marigold at the sides of the gardenpea field attracts the adult female moths to lay eggs on marigold flower. Release of *Trichogramma* sp. at the time of flowering (1 card/200 m<sup>2</sup>) is recommended (3-4 releases at 7-10 days duration). Installation of pheromone traps (Heli lure®) @ 12 per ha attracts and capture adult male moths leading to pest management. Placement of bird perches 15 - 20 per ha to invite insectivorous birds. Spray of 5% *neem* seed kernel extract against early instar larvae. Spray of Bt 2g/L for the larval management.



*Dashparni* extract is useful to manage all kind of insect-pests. 5-6 litres of *dashparni* extract is diluted in 250 litres of water for spraying one ha crop area.

#### Harvesting, threshing and storage

The green pod pickings may be done during the morning or evening. The pea plants are very tender with soft stem and therefore pickings should be done gently. A small jerk damages the vines thereby injuring the plants.

After harvest, pods can be marketed immediately. The green pods may be handled carefully. Proper storage at low temperature and humidity may prolong the availability duration of green peas and reduce the losses due to fungal diseases by arresting the metabolic breakdown. Adequate packaging may be done in gunny bags, baskets lined with jute cloth, bamboo baskets, corrugated fibre board boxes and plastic containers.

#### For further details, contact us

##### The Director

ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan,  
Almora-263 601 (Uttarakhand)  
Tel No. (05962) 230208, Fax (05962) 231439  
Email: director.vpkas@icar.gov.in, vpkas@nic.in  
Website: <http://www.vpkas.icar.gov.in/>

#### Script

Dibakar Mahanta, J. Stanley, K.K. Mishra  
J.K. Bisht and L. Kant

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# Organic Farming of Gardenpea in Hills



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ICAR-Vivekananda Parvatiya Krishi Anusandhan Sansthan,  
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Toll free Krishak helpline - 1800 180 2311  
Contact Timings - Every working day (10 AM to 5 PM)

**Gardenpea** is one of the most important vegetable crops grown under off-season conditions in the North-Western Himalayas (NWH). It is considered as a cash crop. A rich source of protein (25%), amino acids and sugars (12%), gardenpea is an all-time favourite vegetable.

The concept of organic farming is receiving increased attention, and organic food markets are expanding rapidly. The Indian gardenpea of 410 MT is exported to world market (UAE, Qatar, UK, Nepal, etc.), which earns monetary value of 179 lakh rupees.

The area under gardenpea is increasing day by day. It is cultivated in an area of 39.8 and 13.1 thousand ha in the three states and union territories of NWH; and Uttarakhand, respectively. The productivity of gardenpea in Uttarakhand is 7.14 t/ha, which is very less compared to 10.03 and 10.52 t/ha for all India and three states and union territories of NWH, respectively. However, the yield of gardenpea can be enhanced by improving soil health and following proper organic management.

#### **Climate**

Gardenpea is typically a cool season crop. It requires cold and dry climate while longer cold spell increases its yield. Optimum temperature for seed germination is 22°C. Even though seeds germinate at 5°C, speed of germination is less. At higher temperature, decay of seedlings is more. Early stage of crop is tolerant to frost. But flowering and fruit development are adversely affected by frost. Temperature of 15-25°C is favourable for its cultivation. Optimum monthly mean temperature for growth of plants is 10-18°C. As temperature increases, the maturity is hastened and yield is reduced. Quality of pods produced is also low at high temperature due to conversion of sugars to hemicellulose and starch.

#### **Soil**

Gardenpea can be grown on many types of soils – light sandy loam to clay soil. Well drained, loose, friable and heavy soils are ideal. It does not thrive on acidic soils. It is very sensitive to saline and alkaline conditions. The pH of 6.0-7.5 is ideal. If soil is acidic (pH <5.5), liming is essential.

#### **Field preparation and level of organic manure**

Soil is prepared by disc ploughing followed by one or two harrowing. The soil should not be very pulverized and fine. Well decomposed FYM @ 20 t/ha should be applied during final ploughing. 2 quintal of FYM (4 kg FYM/nali) mixed with 50 g *Trichoderma harzianum* and 200 g *Bacillus cereus* strain WGPSB-2 powder should be incorporated into the soil during field preparation to avoid fungal disease and white grub infestation, respectively. After ploughing, the field should be levelled well.

#### **High yielding variety suitable for organic farming**

VPKAS, Almora has developed a number of varieties suitable for organic farming of gardenpea in the NWH.

**Vivek Matar 10:** It is recommended for cultivation for the entire NWH. It is moderately resistant to powdery mildew, white rot & leaf blight.

**Vivek Matar 12:** It is recommended for cultivation for the entire NWH. It is moderately resistant to powdery mildew.

**Vivek Matar 11:** It is recommended for cultivation in Uttarakhand. It

has high degree of resistance to powdery mildew, shows resistant against white rot, wilt & leaf blight diseases.

**Vivek Sabji Matar 14:** It is recommended for cultivation in Uttarakhand. It possesses resistance against powdery mildew disease.

**Vivek Sabji Matar 15:** It is recommended for cultivation in Uttarakhand. It exhibits resistance against powdery mildew disease.

**Vivek Sabji Matar 13:** It is recommended for cultivation in Uttarakhand. It is suitable for August sowing in high hills. It is early in maturity and it escapes incidence of powdery mildew when grown as *rabi* season crop.

**VL Ageti Matar 7:** It is recommended for cultivation in Uttarakhand. It possesses superior yielding ability with extra-earliness. It is suitable for sowing in November and in April to September (off-season) in hills. The seeds are very sweet with high TSS (16.8%).

Among the above mentioned high yielding varieties, *Vivek Matar 12*, *Vivek Sabji Matar 13*, *Vivek Sabji Matar 14* and *Vivek Sabji Matar 15* are having very high pod yielding potential (>11 t/ha)

#### **Sowing Time**

Sowing time of garden pea varies as per the altitude of hills.

**Lower hills (<1000 m above mean sea level):** First fortnight of November

**Medium hills (1000-1700 m above mean sea level):** End of October to first quarter of November.

**High hills (1700-2500 m above mean sea level):** Second fortnight of August (at the end of monsoon rain) or the end of February to the end of April

**Higher hills (>2500 m above mean sea level):** April-May

#### **Seed rate, spacing and depth of sowing**

Viable, healthy, well-mature and pure seeds should be used for sowing. About 75-100 kg seed is sufficient per hectare (1.5-2.0 kg/nali). Overnight soaking of seeds in water improves germination. 10-20% more seed rate should be used for sowing of August/September sown crops. Seeds should be drilled in small furrow line with proper row distance. The furrow line can be drawn with help of *kutla* (hand hoe) or by the local plough. The crop should be sown with a spacing of 30 cm (row to row) × 5-7.5 cm (intra-row) for higher yield. Seeds should not be sown deeper than 3-4 cm for good germination. Otherwise, it will be difficult to maintain optimum population. Sowing of gardenpea should not be done through broadcasting. All the seeds broadcast do not get proper contact with moist soil. Secondly some seeds are left uncovered and are eaten away by birds. This results in poor and uneven germination.

#### **Seed treatment**

The seed should be inoculated with *Rhizobium*, phosphate solubilizing bacteria (PSB) (*Pseudomonas fragii*) and plant growth promoting rhizo-bacteria (PGPR) (PGERS17) to enhance the pod yield. The *beejamrit* (prepared from indigenous cow dung, lime, undisturbed soils from forest and indigenous cow urine) can also be used as seed treatment. The seeds (1.5-1.6 kg per nali) should be made wet by sprinkling water 2-3 hours before sowing. Then, seeds are inoculated with 15-20 g each of *Rhizobium*, PSB and PGPR and

kept on newspaper for drying in shadow. It is better to sow seeds of inoculated gardenpea during evening hours. The inoculated seed should neither be dried nor sown during bright sunshine.

#### **Crop management**

Gardenpea being a legume crop, if planted year after year in the same field creates problem of wilt complex and other soil borne diseases. To check this damage, gardenpea crop may be rotated with other vegetable crops. Besides, crop rotation also helps in maintaining balance of soil nutrients. Spraying of *jeevamrit* @ 500 litres per ha twice a month enhances the yield. Spraying of 3% *panchagavya* and vermiwash enhances the soil health and pod yield.

#### **Water management**

For proper germination pre-sowing irrigation is a must, if the soils are dry. It is sensitive to drought and excessive irrigation. Irrigation frequency depends on the nature of soils and winter showers. Normally 4-5 irrigations are needed in the NWH. If the soils are lighter and shallow, the number can be increased. Excess of moisture results in yellowing of crop and reduces the yield. Soil moisture deficit reduces growth and also affects nodulation. Furrow irrigation is normally adopted for irrigating gardenpea but sprinkler system of irrigation is much better. Moisture stress at flowering and subsequent pod filling stage is most undesirable and affects the yield and quality of pods.

#### **Weed management**

There is a heavy weed growth in gardenpea right from sowing till harvest. This is due to slow growth of pea during early stages. Usually, 1-2 hand weeding is sufficient. Weeds can also be controlled by early mechanical means but deep harrowing damages the roots. Late inter-cultural operations may also damage the crop due to trampling and mechanical breakage of tender and succulent stems and branches.

#### **Disease management**

**Ascochyta blight (*Ascochyta pisi*):** Ascochyta blight appears as purple lesions on leaves, stems and pods which may expand and produce a concentric ring pattern. Both pods and seeds may be affected and severe infections kill seedlings. Remove and destroy diseased plants as soon as symptoms appear. Preventative measures such as crop rotation with non-susceptible crops on a yearly basis and planting of disease free seeds are recommended.



**Downy mildew (*Peronospora pisi*):** The plant will develop lesions that are greenish, yellow to brown in colour on the upper leaf surfaces and mouse-grey, fluffy areas on the undersides of the leaves directly under the upper lesions. Resistant varieties should be used. Rotate with non-host crop for at least 2-3 years that helps in reducing the primary inoculum. Remove and burn the diseased plants soon after detecting in the field.

