GRASS PEAS FOR DIVERSIFICATION AND SUSTAINABLE FOOD PRODUCTION

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ABSTRACT
Grass pea (\textit{Lathyrus sativus} L.) is also known as Lathyrus, a well-known pulse crop. It is grown for fodder and human consumption as dal. It is also known as Indian pea, blue sweet pea, chickling pea, white vetch, and khesari in Hindi. It is a very hardy and drought-tolerant crop. It is grown in low-rainfall areas under rainfed conditions where chickpea, lentils, and pea are not expected to give good yields. This crop has a unique ability to tolerate drought and waterlogging conditions but grows best in moist soils. It is an insurance crop as it produces reliable yields when all other crop fails. Lathyrus is considered one of the most important climate-resilient crops. Lathyrus crop can save about 35-50 kg ha\textsuperscript{-1} nitrogen for the succeeding crop through biological nitrogen fixation and decomposition of plant parts.

NUTRITIONAL VALUE AND CHEMICAL COMPOSITION
Lathyrus seed contains about 32% protein, 54% carbohydrate, 0.9% fat, and 3.2% ash. Neurotoxin ODAP, also known as β-N-oxalyl-amino-L-alanine (BOAA), is the primary health concern associated with grass pea consumption. Lathyrism may affect anyone consuming a diet consisting of more than 25% grass pea for 3–4 months (Asthana 1996 and Rao et al., 1969). In India, the cultivation of Lathyrus is mainly concentrated in the Chhattisgarh region, from where reported cases of human lathyrism are limited compared to the high number of human lathyrism incidents in the Rewa Division Madhya Pradesh state (Ganapathy and Roy).

CLIMATE AND SOIL
Lathyrus is a winter season crop and grows well under a temperate climate. It has good adoption under climatic extremities and requires 15 °C to 25 °C temperatures during sowing to harvesting. Lathyrus can be grown successfully in all types of soils except high acidic soils (pH less than 6.0). Generally, it prefers heavy, loamy, and deep black soils and can be grown in low-lying areas that are not suited to other crops. For good production, deep summer plowing should be done once in 3 years. It can be grown in a standing paddy crop as utera or relay crop due to its ability to withstand high moisture conditions at sowing time and moisture stress during the growth period.
VARIETIES

Bio L-212 (Ratan), RLS-4595, B-1, LS 157-14, HD-3, LSD-6, Prateek, MahaTeora, Pusa-24 and Rajendra Khesari 1

SEED AND SOWING

For line sowing, a seed rate of 40-60 kg ha\(^{-1}\) and for broadcasting and utera system, 70-80 kg ha\(^{-1}\) seed is required. Under utera cropping, seed should be sown as broadcast in-between the rice rows. Whereas, for normal sowing, a spacing of 30 cm x 10 cm is recommended. As a pure crop, it is sown on residual soil moisture after harvesting of Kharif crop during the last week of October to the first week of November. However, the last week of September or the first week of October is best for sowing under utera cropping. Before sowing the crop, the seed should be treated with 3 g kg\(^{-1}\) of Thirum. After seed treatment with fungicide, the seed should be inoculated with *Rhizobium* and PSB culture @ 5-7 g kg\(^{-1}\) of seed.

NUTRIENT MANAGEMENT

Generally, this crop is grown on residual fertility of rice under utera/paira cropping. In this case, if the crop is grown on a highly phosphorus fertilized paddy field, there is no need to apply phosphorus. However, in the area where phosphorus deficiency is observed, it responds well to phosphorus up to 40-60 kg ha\(^{-1}\). For normal crop growth, application of fertilizer dose @100 kg DAP + 100 kg gypsum ha\(^{-1}\) is recommended. The application of fertilizer should be applied based on soil test value. Foliar application of 2% urea or 20 ppm Salicylic acid at flowering and pod formation stage increases the yield.

IRRIGATION/WATER MANAGEMENT

Lathyrus is grown as a rain-fed crop on residual moisture. However, one irrigation at 60-70 days after sowing may be remunerative in terms of production under high moisture stress conditions.

WEED MANAGEMENT

For effective weed management spray fluchloralin (Basalin) 45 EC @ 0.75-1 kg a.i. ha\(^{-1}\) in 750-1000 liters of water as pre-plant incorporation. If heavy weed infestation prevails, one hand-weeding at 30-35 days after sowing is recommended.

PLANT PROTECTION MEASURES

**INSECTS/PESTS:** Aphid is the most problematic insect of Lathyrus, which sucks the juice from the leaves, and leaves turn brown and crumpled, and the plant looks sick. For effective control of Aphid spray systemic insecticide.

These are the following three major diseases of Lathyrus:

**DOWNY MILDEW:** This disease is caused by the fungus *Peronospora* *spp.* The brownish cottony growth of fungus may be seen on the lower surface of the infected leaves. Yellow to greenish spots is also visible. To control this disease, spray the crop with Mancozeb 75 WP @ 2 g L\(^{-1}\) of water.
POWDERY MILDEW: The fungus *Erysiphe polygoni* causes powdery mildew in the plants. Symptoms of disease first appear on all the aerial parts of the plant. Powdery masses of spores formed on leaves may collapse and cover the whole leaf with powdery growth. To control powdery mildew spray with Carbendazim @ 1 g L\(^{-1}\) or wettable Sulphur @ 3 g L\(^{-1}\) or Dinocap @ 1 ml L\(^{-1}\) of water.

RUST: The casual fungus of this disease is *Uromyces fabae*. The pink to brown pustules appeared on leaves and stems. However, the affected plants parts dry in a severe attack. To control this disease, grow early maturing variety. Seed treatment should be done with Carbendazim @ 2 g kg\(^{-1}\) seed. Spray the infected crop with Mancozeb 75 WP @ 2 g L\(^{-1}\) of water.

HARVESTING AND THRESHING

The crop should be harvest when the color of pods changes to brown and grains become hard, having approximately 15% moisture. After harvesting, the product may be sun-dried for 4-5 days. Threshing is done by beating with sticks or by the thresher. A well-managed crop can give 8-10 q ha\(^{-1}\) yields under direct sowing and 3-4 q ha\(^{-1}\) under utera cultivation.

PROSPECTS OF LATHYRUS CULTIVATION

Lathyrus has many unique features and characteristics that make it attractive to farmers and consumers. Some most important features of Lathyrus are:

1. Lathyrus crop adapted to growing under harsh climatic conditions such as drought and waterlogged conditions. It requires minimal inputs and therefore is adaptable to ecological sustainability.
2. Lathyrus crops may be grown in areas where flooding from monsoon rains can severely damage other crops.
3. Its seed contains a high protein level, which usually ranges from 25.5-28.5% but can be as high as 32%.
4. It has an agreeable taste that can be utilized in snack foods and is a significant component of the regular diet.
Lathyrus is an important component in sustainable farming systems due to its high biological nitrogen fixation rate, which increases the crop's yield and the succeeding crops.

The grains are used as food for humans or as animal feed.

It can be used as forage or fodder for animals having good palatability.

The leaves of the Lathyrus may be used as leafy vegetables, and the selling of Lathyrus leaves as leafy vegetables create livelihood opportunities for poor farmers.

### MAJOR CONSTRAINTS AND PROBLEMS IN LATHYRUS CULTIVATION

1. **UNAVAILABILITY OF SUITABLE AND HIGH YIELDING VARIETIES:** In India, suitable and high-yielding varieties of Lathyrus are not available. Only a few high-yielding and low-toxin varieties have been released in India, and their seeds are not available to farmers. Farmers are using only local varieties for cultivation.

2. **UNAVAILABILITY OF QUALITY SEEDS:** Generally, farmers are unaware of the improved varieties, and no good seed productions program of low-toxin improved varieties has been taken into consideration. Unavailability of good quality Lathyrus seeds having low BOAA content and its traditional varieties have low yield potential.

3. **INADEQUATE PLANT POPULATION:** Generally, the crop faces excessive moisture at sowing and water stress at its growth stages, resulting in poor plant stand at maturity, and this is a major constraint to achieve maximum yield.

4. **PLANT PROTECTION MEASURES:** No plant protection measures are taken into consideration to grow this crop. Some diseases like rust and powdery mildew affect the Lathyrus yield inspite of having high tolerant ability.

5. **LACK OF TECHNICAL AWARENESS:** Lack of awareness amongst farmers about the benefit of improved variety and profitable production technology. Farmers of India have not yet been provided with the standardized package of Lathyrus cultivation practices and less support from the public extension system in Lathyrus cultivation.

6. **LACK OF BIO FERTILIZERS AVAILABILITY:** Unavailability of the efficient strain of *Rhizobium* for commercial use in grass pea growing regions.
7. **HIGH CROP WEED-COMPETITION**: High crop-weed competition at initial crop growth stages in relay cropping on residual soil moisture due to heavy weed infestation, reducing production quality and quantity.

**CONCLUSION**

In India, there is a greater scope of Lathyrus cultivation. Due to its hardy nature, it can be grown where other pulse crops fail to survive and not give a good yield. In the different parts of India, due to low prices, poor people include Lathyrus in their food habits. The Lathyrus cultivation creates livelihood opportunities for the farmers. Farmers fear the consumption of Lathyrus due to the presence of a neurotoxin, and its popularity goes down. There is a need to provide less BOAA content Lathyrus seed to the farmers and develop improved packages and practices to make them aware of the benefits of Lathyrus cultivation.

**REFERENCES**


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