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Buckwheat (*Fagopyrum* spp.) Cultivation in India

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Abstract

Buckwheat is a pseudo-cereal belongs to the family Polygonaceae. Buckwheat is cultivated primarily to obtain grains for human consumption. It is known to contain various anti-oxidative compounds such vitamins B1, B2, and E, and phenolic compounds. Buckwheat is normally a plant of cool, moist, temperate region. Buckwheat has higher tolerance to soil acidity than any other grain crop. Being a cover crop, it does not require extensive land preparation and can grow well on poorly tilled soil. Local cultivars Mithey, Tithey, PRB-1, VL-Ugal and Sangla B-1 are some important varieties of buckwheat. It can provide grain yield of 12-14 q ha^{-1}.

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Introduction

Buckwheat is one of the most important green manure crops that produce nutrition-rich triangular seeds (Wang *et al.*, 2022). Buckwheat is called a phosphorus pump because it takes up soil phosphorus and then returns it in a planet-friendly way. Buckwheat is an important crop of the mountain regions at elevations above 1,400 m for grain and green leaves. In the higher Himalayas, up to 4,500 m, this is the only crop which can be grown successfully. There are two species of buckwheat cultivated in the Himalayas hills (*F. esculentum* and *F. tataricum*). Buckwheat belongs to the family Polygonaceae and belongs to the category of dicot pseudo-cereals. Buckwheat is also grown as a cover crop to smother weeds and improve the soil fertility. Buckwheat is cultivated primarily to obtain grains for human consumption. It is also grown for livestock and poultry feeds. The protein is high quality due to its high lysine content, which is normally deficient in cereal products. Buckwheat is a health food because it is rich in essential nutrients including protein and mineral. It is known to contain various anti-oxidative compounds such vitamins B1, B2, and E, and phenolic compounds.

Climate

Buckwheat is normally a plant of cool, moist, temperate region. It is sensitive to high temperatures and hot dry winds especially when moisture is scarce. Flowering at temperatures above 30 °C is accompanied by desiccation of fruit and lowering of yield. Low soil moisture levels during the periods of high temperatures can aggravate the situation. Adequate soil moisture level seems essential throughout the growing season. Buckwheat can be severely damaged by late spring or early fall frost. Buckwheat grows well under a wide range of conditions but tends to lodge when subjected to high winds or heavy rains and when grown on very fertile soils. Tartary buckwheat is a hard plant and useful in short season climates and poor soils. It stands well both in heat and cold better than common buckwheat.

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Soil

Buckwheat grows on a wide range of soil and fertility levels. Buckwheat has higher tolerance to soil acidity than any other grain crop. It is best suited to light to medium textured, well-drained soils such as sandy loams, loams and silt loams. It does not grow well in heavy, wet soils or in soils that contain high levels of limestone. It produces a better crop than other grains on infertile, poorly drained soils if the climate is moist and cool. It is an efficient crop in extracting phosphorus of low availability from the soil. In addition, soils high in nitrogen, lodging may occur and cause a reduction in yield. Once lodged, a buckwheat plant does not return upright. Crusting on clay soils may result in an unsatisfactory stand because of poor seedling emergence.

Field Preparation

Buckwheat can grow well only after one ploughing and on land that has recently been cleared for cultivation. Field is prepared by one deep ploughing followed by two harrowing/ tilling and planking results in good germination and uniform stand of the crop. It may also help the crop to achieve higher rate of establishment and early growth. Being a cover crop, it does not require extensive land preparation and can grow well on poorly tilled soil.

Recommended Varieties

Local cultivars Mithey, Tithey, PRB-1, VL-Ugal and Sangla B-1.

Seed Rate and Sowing

Healthy and disease-free quality seed should be selected for sowing purposes. The growing season in the State varies due to varied altitudes and rainfall pattern. The sowing time of buckwheat mainly depends on agro-climatic conditions and altitude in Sikkim. Generally, the seed should be sown in mid altitude after harvesting of Kharif crops particularly in the month of October to November. However, it may be grown in any season in Sikkim in view of its natural ability to grow well throughout the year. For leafy vegetable purpose it can be grown from February to October under controlled conditions. The seeding rate varies from 35-40 kg ha^{-1} for a grain crop. It is about 50 kg ha^{-1} when buckwheat is grown as a cover crop/ fodder crop/ vegetable crop. In buckwheat, higher seed rate is generally used to promote faster canopy development and higher population for better weed control. Buckwheat should be placed at 3-5 cm deep in line and kept 30-45 cm row to row spacing and 10-15 cm from plant to plant spacing depending upon varieties. Thinning may start at 15-20 days after sowing to kept proper space. The crop emerges usually within 4-5 days (Arya and Kumar, 2021).

Organic Nutrient Management

Farmers of the state generally grow buckwheat on residual fertility without adding other nutrient input. However, it removes 47 kg nitrogen, 22 kg phosphorus and 40 kg potassium from the soil for each hectare planted and gives a yield of 1,600 kg ha^{-1}. Buckwheat does not well respond to the nitrogen fertilization hence, nitrogen should be applied on soil test value. High application of nitrogen can create weed pressure, encourages excessive vegetative growth, causes lodging, and decreases grain yield. ICAR-NOFRI (earlier ICAR Sikkim Centre) recommends application of Azophos seed treatment + mixed compost @ 5 t ha^{-1} + neem cake @ 0.5 t /ha^{-1} for obtaining good crop yield. *Azospirillum* spp. and *Azotobacter* spp. thrives well in acidic soils of Sikkim and their combined application resulted in better buckwheat productivity and positively influenced the soil biological properties.

Water Management

Generally, buckwheat is grown as rainfed crop in Sikkim. However, the most critical stages are pre-flowering and pod formation stage for buckwheat.

Weed Management

Very limited options are available for weed control in buckwheat under organic farming situation; hence, it may limit to certain cultural and mechanical practices. Although buckwheat plants are very good competitor for weeds and generally fast growing capacity makes them a smother crop. Under such conditions, one weeding and hoeing at 20-25 DAS is helpful for raising a good crop. Firstly, the crop should be seeded into a fine, firm and weed-free seedbed. Secondly, the seed should be placed into moist soil to ensure quick germination and emergence. These practices help the crop compete with any emerging weeds.

Hilling

Buckwheat tends very heavy branching capacity and weak stems, which makes them susceptible to lodging. The plants lodge easily and thus hilling at 30-35 DAS stage is required. Lodging is dependent on the plant population and on gaps between the plants. Therefore, in buckwheat it is recommended that plant population should be kept at optimum so that yield should not be reduced due to lodging.

Insects and Diseases

Buckwheat is normally a cold tolerant crop and is not attacked by many diseases or pests. However, a number of diseases and pests have been reported on this crop. The diseases are leaf spot, smut, root and stem rot, brown leaf spot, powdery mildew, rust, root and collar rot, root rot, stem rot, chlorotic leaf spot, downy mildew and major pests bruchids, grain moth, cut worm, storage beetles and aphids. Attacks of several viruses also cause reduction in plant height and losses in grain yield. Bird damage, particularly by doves has been observed in this crop.

Harvesting and Threshing

Timely harvesting of buckwheat is essential to prevent shattering of grains. Generally late harvesting was observed in high altitude while early harvesting was done in the mid and low altitude areas. Yield of 12-14 q ha^{-1} is expected from well managed crop. The plant shows irregular time of maturity because of indeterminate growth habit. If the harvesting is delayed, shattering will start which may cause huge loss. Careful handling of the crop is very important because grain shattering results in losses up to 25 percent. Due to its gradual formation and maturity, harvesting is done periodically and finally the crop is cut and then threshed when the rest of the seeds are fully matured. After harvesting the seeds must be well-dried and kept at about 14 percent or less moisture for the safe storage of buckwheat grains. Over-matured seeds when in contact with high moisture, germinate very quickly as the seeds have vivipary characteristics.

Conclusion

Buckwheat is one of the most important green manure crops that produce nutrition-rich triangular seeds. Buckwheat is also grown as a cover crop to smother weeds and improve the soil fertility. The protein found in buckwheat is high quality due to its high lysine content, which is normally deficient in cereal products. Buckwheat grows on a wide range of soil and fertility levels. The seeding rate of buckwheat varies from 35-40 kg ha^{-1} for a grain crop. It is about 50 kg ha^{-1} when buckwheat is grown as a cover crop/ fodder crop/ vegetable crop. The plants lodge easily and thus hilling at 30-35 DAS stage is required. In buckwheat yield of 12-14 q ha^{-1} is expected from well managed crop.

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