



Kale production: Package of Practices



Pest and Disease Management

Kale is highly resistant to most of the pests and diseases. Some of the pests like aphids, cabbage worms, loopers, flea beetles, harlequin bugs, and cutworms can damage seedlings, leaves and whole plants to reduce plant vigor and impact overall yield.

Major diseases affecting kale include black rot (*Xanthomonas campestris*), Alternaria leaf spot, downy mildew, powdery mildew, bacterial leaf spot, and clubroot.

Management strategies encompass the use of certified disease-free seed, timely removal of infected plants, crop rotation (minimum three years without brassicas), improving soil drainage, lime amendment for clubroot, and applying organic sprays such as copper, Bordeaux mixture, or biofertilizers for disease suppression. Regular crop inspection, prompt removal of infected plant material, and avoiding overhead irrigation further reduce disease incidence in kale crop.



Caterpillar damage in kale at ICAR-CITH, Srinagar



Alternaria and black rot of kale at ICAR-CITH, Srinagar

Harvesting and Yield

Kale harvesting starts in the month of October and continues till December end in Kashmir conditions. Harvesting of kale should be done at appropriate vegetative stage to obtain best quality harvest. Usually, tender horticulturally matured leaf stage with stalk is best preferred. The autumn sown crop usually yields more compared to spring sown crop. On an average it yields 150-300 q/ha.



Harvesting of kale grown at ICAR-CITH, Srinagar

Post-Harvest Handling

The individual leaves of kale are harvested at edible maturity, sorted according to size and small bundles are made. After packaging, packing in bags, the produce is sent to the market. The green leaves cannot be kept for a long period in ambient conditions. Hence refrigerated transportation is necessary for distant markets.

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Introduction

Kale (*Brassica oleracea* var. *acephala*) is a temperate leafy vegetable popular due to its exceptional nutritional profile and versatility in diets. Traditionally, kale is cultivated on a commercial scale in India's temperate regions, especially in Jammu and Kashmir and some other temperate regions where the climate and soil conditions favor robust growth. Commercial cultivation of kale is almost non-existing in most of the Indian states primarily due to limited climatic suitability and negligible market demand.

Climate and Soil Requirements

Although it may be grown in areas with chilly winters, kale is primarily grown in temperate climates. One of the hardiest crops, it can withstand temperatures as low as subzero. However, certain types can grow well in subtropical areas also.

A well-drained and fertile sandy-loam soils with a pH of 5.5 to 7.5 are best suited for its cultivation. However, because it is salt tolerant, it has also been grown in salt affected soils. Soils should be well drained to avoid water stagnation.



Land preparation and layout of experiment for kale in ICAR -CITH, Srinagar, Kashmir, India

Cultivation

Kale is propagated through the seeds. Prepare the nursery starting on mid-July to mid-August, seedlings that are 30 to 35 days old are suitable for transplantation. The field should be thoroughly prepared with two-to-three-disc ploughs. It should be well pulverized and worked at its ideal soil moisture content. The transplanting can be done from first week of the September. Sometimes, direct sowing is also practiced.



Nursery of kale variety GM Dari at ICAR-CITH, Srinagar

Depending on the spacing, 450-500g of seed is needed to grow seedlings per hectare. The seedlings are usually transplanted at 45 cm x 45 cm row-row and plant-plant spacing to support 49000 plants/ha. It is also commonly advised to use spacing of 45cm x 45cm, 45cm x 30 cm and 30cm x 30cm based on cultivar.

Manuring and Fertilization

Kale responds well to manuring and fertilization. Generally well-rotten farmyard manure @ 20-25 tones/ha is applied at the time of land preparation. The N:P: K requirement for crop is 150:75:75 kg per hectare. The half of nitrogen and complete phosphorous and potassium required are applied at the time of transplanting. The other half of nitrogen is then given at 30 – 40 days after transplanting and 15-20 days prior to first harvesting in equal doses.



Fertilizers and manure application in kale field at ICAR - CITH, Srinagar

Irrigation

Irrigation requirement of the crop depends on the available soil moisture content. Kale being a hardy crop can withstand drought reasonably well. Irrigation should be scheduled compulsory immediately after transplanting in order to overcome the transplanting shock and to hold the roots in soil. Subsequent irrigation is given at 15 – 20 days interval based on moisture prevailing in the soil.



Transplanting and irrigating kale at ICAR-CITH, Srinagar

Weed Management

Shallow hoeing should be done to remove weeds and loosen the soil for better aeration. Weeding is must at initial stage of crop development as weeds pose significant damage to crop development. Usually, 2-3 times hoeing and weeding are sufficient. Once the leaves cover the soil there is no need for hoeing. Shallow hoeing should be done to avoid root injury



Weeding in kale at ICAR - CITH, Srinagar