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Rabi fennel crop pays dividend to the farmers of North Gujarat region

Fennel is a native of Mediterranean countries and belongs to the Apiaceae family. India is the world's largest producer, consumer and exporter of seed spices and is known as home of spices. States of Gujarat and Rajasthan together contribute more than 80% of the total seed spices production of the India, so both the states together are known as 'Seed Spices Bowl of India'. Gujarat alone accounts for more than 90% fennel production in the country. According to Horticultural Statistics at a Glance (2018), the area, production and productivity of fennel in India were 66 thousand hectares, 104 thousand tonnes and 1,702 kg/ha, respectively. In India, Gujarat ranks first in fennel production producing 96,770 tonnes from an area of 45,400 hectare followed by Rajasthan at 30,720 tonnes from an area 27,590 hectares.

NORTH Gujarat region is known for fennel (*Foeniculum vulgare Mill.*) cultivation. The farmers of Sabarkantha district, in particular, prefer to grow fennel as seed spice crop in *rabi* season. Initially, farmers were cultivating local fennel varieties with conventional method thereby receiving low yield per unit area. KVK, Sabarkantha helped farmers by providing new varieties and field demonstrations.

Cultivation

Cool climate is ideal for fennel cultivation in *rabi* season. Well drained loam soil with *p*H 6.5-8.0 is ideal for fennel cultivation. For *rabi* season under North Gujarat Agro-climatic region, Gujarat Fennel-11 and Gujarat Fennel-12 varieties developed by Seed Spices Research Station, Sardarkrushinagar Dantiwada Agricultural University, Jagudan, Gujarat are suitable. Fennel cv Gujarat Fennel-11 is high yielding variety and Gujarat Fennel-12 is high yielding and resistant to lodging. Time of sowing is an important factor for growth and development of fennel crop. Sowing can be done during last week of October to first week of November for *rabi* season. Seed rate recommended is 4-5 kg/ha with a spacing of 45 cm × 22.5 cm. The seeds are to be sown at 2 cm depth. The farmers of Sabarkantha district of North Gujarat region are adopting line sowing with distance of 120 cm × 10-12.5 cm between rows and plants for easy intercultural operations.

Line sowing method in fennel

Line sowing method in fennel

As per ICAR-National Research Center on Seed Spices, Ajmer, Rajasthan, recommended seed rate is 8 to 10 kg/ha for direct sowing at spacing of 50-60 cm × 25-30 cm. Seeds should be treated with carbendezim and Captan (2.5-3 g/kg seed) or seed can be treated with *Trichoderma* (4-10 g/kg seed). No seed treatment is required for already treated and packed seeds. The bio-fertilizers and bio-fungicides should not be used with chemicals for seed treatment, it should be done after chemical treatment.

Nutrient management

The dose of manure and fertilizer depends upon the soil health and nutrients content, so it may be changed as per soil test report (region to region). When the nutrient content of soil is average, 10-15 t organic manure (FYM), 90 kg N and 30 kg P_2O_5 per hectare is recommended for North Gujarat region. Total dose of phosphorus and half dose of nitrogen are to be applied before sowing as basal dose. Remaining half dose of nitrogen is to be top-dressed at 30 and 60 days after sowing equally as split dose. As dose of manure and fertilizer depends upon the soil health and nutrients content (region to region), ICAR-NRC on

Seed Spices, Ajmer, Rajasthan recommended 90 kg N, 40 kg P_2O_5 and 30 kg K_2O per hectare. Total dose of organic manure (FYM), P and K are to be applied before sowing as basal dose. Half dose of nitrogen is to be applied as basal dose and remaining half dose of nitrogen is to be top-dressed at 30 and 60 days after sowing equally as split dose followed by irrigation. Research evidences encourage towards the integrated use of organic + inorganic + bio-fertilizers which can improve the soil productivity and crop yield. Bio-fertilizers are applied for their positive effect on the soil fertility status and nutrient uptake. Bio-fertilizers like *Azotobacter* and PSB (2.5 kg/ha each) can be applied by mixing with vermicompost or well decomposed farm yard manure (FYM) directly to the crop which enhances yield by saving 25% of recommended dose of fertilizers (RDF). Liquid bio-fertilizers can be used for application through drip irrigation after one week of recommended dose of fertilizers application. Bio-fertilizers and bio-fungicides should not be used with chemical fertilizers or any agrochemicals.

Aftercare

Irrigation should be adjusted in accordance with prevailing weather and soil conditions. The crop must be irrigated during its critical stages. Special care is needed till germination, the soil should have sufficient moisture for germination. Farmers of North Gujarat region are advised to irrigate *rabi* fennel crop at sowing, 8th and 33rd days after sowing and remaining 7 irrigations at an interval of 12 to 15 days. Drip irrigation can be followed for efficient water use, fertilizer use efficiency, to reduce physiological disorders, and more yield. Distance between laterals are to be kept 90 cm and distance between emitters 60 cm. Provide irrigation by drip 30 minutes in September, 75 minutes in October to November and 60 minutes in December to February at an alternate day having discharge rate of 4 litre/hr and pressure 1.2 kg/cm^2 .

Weeds compete with crop for space, water and nutrients. Hence, the weed-free condition in the fennel crop must be ensured. Gap filling, thinning and intercultural practices are to be done as per the need and weed infestation. Before fennel seed germination, the pre-emergence herbicide pendimethalin 30 EC @ 1 litre through 500 litres of water can be sprayed for 1 ha at sufficient soil moisture condition for effective weed control. After 30-45 days, the crop is to be earthed up.

Harvesting, yield and economics (Demonstrations on farmers' field, 2020-21)

Farmers sowed fennel cv GF-12 during mid-November and harvested during mid-April. Plucking of umbels is to be done when seeds are fully developed but still green. After ripening, umbels are dried in sunlight for 1-2 days and then in shade for 8-10 days. Longer exposure to sunlight changes the colour and lustre of seeds, reducing their quality.

Seed setting in fennel cv GF-12

Shade drying of fennel umbels

Thinning in fennel

Earthing up in fennel

SUCCESS STORY

KVK, Sabarkantha intervention: Shri. Arvindbhai Bhanjibhai Patel from Ravipura Kampa and Shri. Manibhai Ratibhai Patel from Pratapgad Kampa are progressive fennel farmers. As progressive farmers, they always wanted to improve the fennel productivity by adopting improved varieties and new technologies. They visited KVK, Sabarkantha and got the information regarding scientific fennel cultivation. KVK scientists started frontline demonstration (FLD) on their farms by providing fennel seed of improved variety Gujarat Fennel-12 (GF-12) along with other inputs for pest and disease management. Scientists also provided technical knowledge through various extension activities like field visit, on-campus training, off-campus trainings and field days, etc.

The objectives behind demonstrations were adoption of improved varieties and technologies. These farmers followed scientific cultivation of fennel under guidance of KVK scientists. By following scientific cultivation of fennel with improved fennel varieties, they are receiving more yields thereby earning more profit per unit area than conventional method of crop management. With the help of KVK scientists interventions, they realized that their income can be increased from this venture.

KVK, Scientists organized fennel field day on Shri. Manibhai Ratibhai Patel's field

Shri. Arvindbhai Bhanjibhai Patel's fennel cv GF-12 field

Shri. Manibhai Ratibhai Patel's fennel cv GF-12 field

Yield differs as per variety, soil type, climatic condition, etc. From two farmers' field (2020-21), yield obtained was 18.75-22.50 q/ha with recommended package of practices and crop spacing 120 cm×10-12.5 cm. By adopting KVK scientist's improved variety Gujarat Fennel-12 (GF-12) interventions (frontline demonstrations), farmers are getting more yield over the local variety (farmer's practice). Farmer's practice with local variety gave average yield 16.50 q/ha, net return of ₹75000/ha and B:C ratio of 3.66. Recommended practice (demonstration) with improved variety GF-12 gave average yield 18.75 q/ha (13.63% increase over the local practice), net return of ₹89471/ha and B:C ratio of 4.22 from Shri. Arvindbhai Bhanjibhai Patel's field whereas, yield 22.50 q/ha (36.36% increase over the local practice), net return of ₹112908/ha and B:C ratio of 5.07 from Shri. Manibhai Ratibhai Patel's field. Average selling price of produce during 2020 was ₹62.5/kg.

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