

Course Name- Field Crops-I
Course code- BSCAG-211

BASMATI RICE

Basmati rice is known for its fragrance and unique flavor. It is popularly known as 'Queen of Rice' and 'Pearl of Rice'. All aromatic rice is not basmati rice. India is the largest cultivator, consumer and exporter of basmati rice. India enjoys monopoly over basmati in the world markets. Basmati rice is exported to more than 80 countries mainly to Saudi Arabia, United Arab Emirates, Iran, Kuwait and others Gulf and European Countries United Kingdom, Sweden, Netherlands, Belgium, Italy. Half the quantity of basmati exported from the country is sela (parboiled) basmati mainly to the gulf countries.

Features of Basmati rice:

Basmati has originated from **Vasumati** which means earth recognized by its fragrance; while the full exposition of the word is from Hindi 'Bas'. originating from '**Prakrit**' Vas which has a **Sanskrit root - Vasay** connoting aroma; and mati from may up meaning in grained from the origin. Common usage has changed Vas to Bas while joining Bas and mayup the latter changed to mati. An alkaloid '**pandamarilactone**' is the cause of fragrance. This alkaloid is present in the leaves of '**Pandanus**' also. Basmati rice is characterized by extra - long, superfine slender grains having a length to breadth ratio of more than 3.5, sweet taste, soft texture, delicate curvature and an extra elongation with least breadth - wise swelling on cooking. Basmati rice gives pleasant flavor after cooking, Basmati rice are poor yielders, prone to lodging and to the onslaughts of pests. In India, Basmati rice is characterized by extra - long, superfine slender grains having a length to breadth ratio of more than 3.5, sweet taste, soft texture, delicate curvature and an extra elongation with least breadth - wise swelling on cooking. These superfine best qualities of Basmati rice are most preferred specially for Biryani and Pulao preparation on special occasion and also meant for high premium value in the national and international market.

Origin:

Basmati rice originated in India.

Distribution:

Basmati rice is grown in Punjab, Haryana, Rajasthan, Jammu and Kashmir, Himachal Pradesh, Uttaranchal and Uttar Pradesh.

Climate:

The rainfall requirement is 700 mm to 1100 mm. The mean temperature ranges from 16.4 to 32.1 ° C. Relative humidity ranges from 65 to 92%.

Soil:

Basmati type rice s is mostly cultivated in alluvial and tarai soils. The soils are neutral to slightly alkaline and calcareous. Soils are loam to clay loam.

Basmati rice varieties:

Basmati 370 (Punjab Basmati), Type - 3 (Dehraduni Basmati rice), Taraori Basmati (HBC-19 or Karnal Local), Basmati 217, Ranbir Basmati, Basmati 370, Basmati 385, Basmati 386, Punjab Basmati -1 , Punjab Basmati 2, Punjab Basmati 3, Kasturi (IET 8580), Haryana Basmati - 1 (IET-10367), Mugad Sugandha (IET 13549), Mahi Sugandha (IET-12601), Pusa Basmati-1121 (IET - 18004), Improved Pusa Basmati - 1 (IET - 18990), Vallabh Basmati - 22 (IET 19492), Pusa Basmati-1 (IET 10364), CSR 30, Vasumati 1 (IET 15391), IET 15392, IET 13846, IET 13548, IET 13549 , IET 14131, IET 14132, Yamini (IET 14720), IET 15833, Pusa Punjab Basmati 1509, Pusa Basmati - 6 (IET-18005), Pusa Basmati 1121.

Agricultural and Processed Food Products Export Development Authority (APEDA) has identified varieties such as kalanamak, tilakchandani and jeerabati (Uttar Pradesh), kala jeera (Odisha), katrani (Bihar), ambemohar (Maharashtra),

govindbhog and badshahbhog (West Bengal), dubraj, badshahbhog and jawaphool (Chhattisgarh) and kala joha (Assam), which could be harnessed and developed for their export potential.

Methods of crop establishment:

The crop can be established either by direct sowing or by transplanting.

Direct seeded rice:

- **Season:** Direct sowing of can be done during second fortnight of June.
- **Seeds and sowing:** Direct seeding is done only in medium to heavy textured soils in unpuddled condition. The seed rate is 20 to 25 kg seed per ha. Seeds are sown with tractor drill at 20 cm row spacing.
- **Weed management:** For controlling weeds, apply Stomp 30 EC @ 1.0 liter / acre within three days after sowing. If needed, apply Bbispribac (Nominee Gold 10 SC) @ 100 ml per acre or Segment 50 DF (Azimsulfuron) @ 16 g per acre as post emergence herbicide at 30 to 35 days after sowing. Spray these herbicides uniformly by mixing them in 150 to 200 liters of water per acre using flat fan or flood jet nozzle for spray. Use Bbispribac (Nominee Gold 10 SC) when the crop is infested with swank and paddy moths are present in the field.
- **Manures and fertilizer application:** Apply 60 kg N per ha in 3 equal splits at 3, 6 and 9 weeks after sowing. Apply P and K only when the soil test shows deficiency of these nutrients.
- **Water management:** To fulfill the water need of the crop, apply irrigation at 5 to 7 days interval depending upon the soil type. The interval may be adjusted with rainfall. Stop irrigation 10 days before harvesting.

Transplanted rice

- **Season:** Basmati crop is generally a Kharif (May to November) crop. The optimum time for nursery sowing is in June. The time of transplanting is a critical factor in determining the yield and quality of the Basmati / aromatic varieties. Some varieties are photoperiod sensitive. These varieties flower when a specific day length is reached. Punjab Mehak 1, Punjab Basmati 2, Punjab Basmati 3 and Pusa Basmati 1121 may be transplanted in first fortnight of July. Optimum time of transplanting for Pusa Punjab Basmati 1509, Basmati 386 and Basmati 370 is second fortnight of July.
- **Nursery management:** A nursery area of 1000 sq m is sufficient to transplant one hectare. Plow nursery field twice under dry condition. Apply wherever possible decomposed and powdered farm yard manure @ 500 kg / 1000 sq.m. Puddle two to three times subsequently by ploughing in standing water of 2-3 cm, preferably at an intervals of five days. Level the field perfectly after final puddling and prepare seedbeds of 1.0 to 1.5 m width and of convenient length leaving 30 cm wide channels in between the beds. Fertilize the seedbeds with 5 to 10 kg N₂O, 5 kg of P₂O₅, and 5 kg of K₂O for every 1000 sq m. area of the nursery before the final leveling. In zinc deficient areas, apply zinc sulphate @ 3-4 kg / 100 sq.m. In calcareous soils, the dry nursery iron chlorosis (seedling yellowing) can be prevented either by spraying 2% ferrous sulphate solution 2 to 3 times at weekly intervals or by frequent inundations. Application of ZnSO₄ @ 20-25 kg / ha is essential for CSR 30 if grown under moderate sodic soil. Use 30 kg of dry seeds per 1000 sq m. Dip the seed in Carbendazim (Bavistin 50 WP) @ 0.05% (5 g) + Streptocycline @ 0.01% (one gram dissolved in 10 liters of water) for 12 hours and smear the seeds with talc formulation of *T. harzianum* @ 15 g kg of seed immediately before sowing. Soak the seeds in gunny bags for 24 hours in water. Subsequently, incubate for 48 hours under sheaves of straw with occasional sprinkling of water. Broadcast the germinated seeds uniformly over the seed bed and keep the beds moist for 4 to 5 days. Gradually raise and maintain water to a depth of 2-5 cm.

Seed and nursery treatment: (i) Seed treatment with streptocycline at 0.3 g + Carbendazim at 1.0 g / kg seed (ii) Trichoderma harzianum + Pseudomonas fluorescens mixture- seed treatment (at 10 g / Kg) + seedling dip (at 10 g / L) + soil application (at 2.5 kg / ha each) (iii) Spray of 3% neem oil in nursery after 15 DAS.

Age of Seedlings: Seedlings of Basmati / aromatic rice varieties are ready for transplanting when they attain 5 to 6 leaf stage or are 20 to 25 days old after sowing for good tillering. The seedling root dip in Carbendazim (Bavistin 50 WP) @ 0.2% or Trichoderma harzianum @ 15 g / liter of water for 6 hours before transplanting.

Planting methods: Transplant two to three seedlings per hill in lines at 20 x 10 cm for high yielding dwarf varieties and 20 x 20 cm for tall statured traditional basmati rice at a shallow depth of 2-3 cm in a well puddled field. In the late transplanted crop the spacing may be reduced to 15 cm x 15 cm (44 hills / sq. Metre) to overcome the reduction in grain yield. Increase the number of seedlings from 2-3 to 5-6 per hill in case of delayed planting.

Weed management: Hand weed twice depending on the level of weed infestation at intervals of three weeks starting from 20 days after transplanting. Any one of the following herbicides viz., Anilophos (0.6 kg a.i. ha⁻¹) In combination with 2.4 D EE (0.53 kg a.i. ha⁻¹), Butachlor (1.5 kg a.i. ha⁻¹) in combination with 2.4 D EE (0.4 kg a.i. ha⁻¹) , Pertilachlor (0.4 kg a.i. ha⁻¹). Pertilachlor (0.4 kg a.i. ha⁻¹) In combination with 2.4 D EE (0.4 kg a.i. ha⁻¹) Is recommended to control weeds.

Manures and fertilizer application: For traditional tall basmati cultivars, apply basally 30 kg P₂O₅, 30 kg of K₂O and 25 kg / ha of ZnSO₄. Apply nitrogen @ 60 kg N / ha in three splits 50% as basal: 25% at tillering and 25% at panicle initiation stages. For high yielding dwarf basmati varieties, apply basally 50 kg P₂O₅, 40 kg of K₂O and 25 kg / ha of ZnSO₄ apply nitrogen @ 90 kg N / ha in three splits 50% as basal: 25% at maximum tillering and 25 % at panicle initiation stages. The field should be drained prior to topdressing with nitrogen and irrigated after 24 to 36 hours. If green manure crop has been grown and included in the main field before rice planting, the quantity of nitrogen may be reduced by 25%.

Water management: Maintain 2-5 cm water throughout the growing season with the mid-season drainage at tillering stage. The crop should not suffer any water stress particularly during flowering. Stop impounding water about a fortnight before harvesting to facilitate easy harvesting.

Cropping systems: The common Basmati rice based cropping systems are viz. , Basmati Rice - Wheat / Sunflower, Basmati Rice - Wheat , Maize / Summer Moong, Basmati Rice- Mentha, Basmati Rice - Berseem (seed), Basmati Rice - Celery - Bajra (Fodder).

Pest management: The major insect pests occur in basmati rice are stem borers, leaf folder, rice hispa and diseases are blast and foot rot. The insect pests can be controlled by spraying cartap hydrochloride (Mortar 75 SG) @ 170 g or Chlorantraniliprole (Coragen 20 SC) @ 60 ml or monocrotophos (Monocil 36 SL) @ 560 ml / acre or Quinolphos or Triazophos at 0.2%; spray carbendazim + mancozeb at 0.2% for sheath blight; Spray of streptocycline 15g + copper oxychloride 500g / ha for bacterial leaf blight. Release of egg parasitoid Trichogramma japonicum at 20 trichocards / ha twice (First after the appearance of adult stem borer / dead hearts in the field followed by second after 10 days interval). Spray of Pseudomonas fluorescens thrice at 0.2% concentration commencing from 45 days after transplanting at 10 days interval to manage sheath blight, blast and sheath rot diseases. Three foliar sprays of neem oil at 3% to manage diseases and insects. Fix bird perches 40 to 50 nos./ha.

Harvest: Basmati rice matures in about 140 days after seeding. Basmati / Aromatic rice varieties should be harvested as soon as they mature i.e. when the ears are nearly ripe and the straw has turned yellow. Delayed harvesting may cause over-ripening and shattering of grains. The harvested crop should be preferably be threshed on the same or next day of harvest. The delayed threshing cause's high shattering losses, reduced head rice recovery and ultimately reduces the market price of paddy.

Yield: The average paddy yield is 3.0 to 4.0 t / ha.

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