



Aromatic Joha Rice Cultivation

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Rice is the major cereal crop playing a significant role in the diet, culture, and economy of millions of people across the world. It is the leading food source in terms of calories being consumed by mankind and feeds about 60 % of the world's population (FAO 2007). It is the primary staple food crop throughout Asia and other part of the world. Today the demand for an increase in productivity and quality of rice in available marginal land is very high. Japonica and Indica are two major subspecies grown in different regions of the world of which Indica is the most widely cultivated variety and popular in terms of consumption.

In the north-eastern region of India, the scented rice locally known as Joha rice is an exclusive type under Sali rice. Joha rice is also known by the name of winter rice or Jaha rice. The geographical indication (GI) tag for Joha rice is given to Assam. Because of its super quality, Joha has a special place among all kinds of rice and is extremely valued.

The characteristic scent of Joha rice is classified as 2-acetyl-1-pyrroline, which is different when compared to the famous basmati rice and another type of aromatic rice. This home-grown rice of Assam, with its high fat and protein namely albumin, globulin, etc. alongside its fragile surface, it is rich in amino acids, proteins, calcium, and iron and is high in starch. It contains a good quantity of phenolic compounds and flavonoids which are a good source of antioxidants. The grain type of joha rice generally ranges from short-slender/bold to medium-slender/bold. Joha rice is invariably grown by the farmers to make desserts such as kheer, pulao, and other forms of delicacies. The global market of scented rice is growing 12% per annum, and India seems to have very few aromatic rice varieties to offer.

Rice Cultivars of Assam

There are four broad divisions of rice cultivars grown in Assam - Sali, Ahu, Boro, and Bao rice, having various traits like stickiness, high starch content, waxy, nonwaxy, aroma flavor, etc. About 70 % of the total agricultural land of Assam is used for rice cultivation.

The four chief categories of rice are classified based on the amount of rainfall and zonal distribution of the state. Sali rice (winter rice); Ahu rice (autumn rice); Boro rice (summer rice); Bao rice (deepwater rice).

Aromatic Rice of Assam

The aromatic rice of Assam is a unique class under Sali rice traditionally known as 'Joha'. This class of rice has high demand in the domestic market and is used mainly for the preparation of special dishes like table rice, Kheer Pulao, and frumenty. The Joha rice cultivars are known for their unique aroma, superfine kernel, good cooking qualities, and excellent palatability. It is very popular due to its inherent scent and is much in demand for export. The area under Joha rice is however nominal owing to its poor yielding ability. The low productivity and yield of this class of rice make it less favorable among the producers. Moreover, due to its aroma, pest attack is frequent, prone to lodging and take a relatively

longer time to mature (120-160 days). Assam maintains a diverse gene pool of aromatic rice that differs in aroma intensity, durability, grain shape and size, production potentialities, etc. Joha rice is grown in marginal lands, uplands, or on Sali seed beds after uprooting the seedlings, late in the season.

Health benefits of Joha rice

- As a result of the polyphenolic and flavonoids constitute of this rice, it kills free radicles and fight aging along with other numerous illnesses.
- It contains fundamental amino acids or proteins that go about as an astounding substitute and plant-based protein for vegetarians.
- It has high fibre content aids in digestion and prevents constipation.
- Help regulate blood sugar levels, making it suitable for diabetics.
- It is suitable for those with gluten intolerance or celiac disease.

Varieties of Joha rice

Different varieties of joha rice are following-

- **Kala Joha-** it is one of the popular traditional joha rice varieties having taller height and prone to lodging. Kala joha varieties (kali jeera, kala joha 1, kala joha 2, kala joha 3) possess medium-slender grains. It is grown in the Sali season and is suitable for rainfed shallow lowlands.
- **Kon Joha-** Kon joha varieties (Kunkuni joha, Maniki joha, and Madhuri joha) grow well on medium land with clay-type soil. It is of medium plant height (125-130 cm) with a duration of 170 days. The grain type of this variety is small and slender. The average yield of this variety is 2-3 t/ha.
- **Kunkuni Joha-** It is a traditional joha rice variety suitable for rainfed shallow lowlands and grown in the Sali season. The average yield of this variety is 1.5 to 2.5 t/ha. And its grain type is small- slender.
- **Bokul Joha-** It is an improved aromatic rice variety developed by Assam Agriculture University and suitable for the Sali season. It is grown well on rainfed shallow lowland areas. The average yield of this variety is 3.5 to 4 t/ha. And grain type is medium bold.
- **Ketaki Joha (IET-14309)-** It is an improved aromatic rice variety developed by AAU, Assam. The plant of this variety is 100 to 105 cm tall and matures in 150 to 160 days. The average grain yield of this variety is 3.5 to 4 t/ha.

Best crop management practices

Seed selection: The seed cleaning should be done in a salt solution (200g salt/liter of water). To check the concentration of the solution, an egg or a potato is to be immersed until it floats. Therefore, the seed should be poured into the solution for cleaning. The light or diseased seeds, which float on the prepared solution, are to be removed.

Seed treatment: Since this class of rice is susceptible to disease, it is advise to adopt seed treatment with recommended fungicide(s). The seed is to be treated with Carboxin @2.5 g/kg of seed. The treated seed is therefore to be incubated for 48-72 hours. Alternatively, the seed can be treated with bio-control agent Trichoderma species @ 10g/kg of seed.

Nursery raising

- **Time of sowing-** mid-May is the most appropriate time for raising a nursery. Seedlings are transplanted after 30-35 days of nursery raising
- **Seed rate-** 40 kg per hectare for both dry and wet raised bed nurseries.
- **Nursery size-** For one hectare of the main field, nursery size should vary between 750 and 1000 m², and not more than 1/10th of the Main field size. The prepared seedbeds have 10 m length and 1.25 m breadth are to be prepared with a 60 cm gap in between the beds.

- **Irrigation-** Irrigate to maintain saturated conditions in the surface soil of the nursery bed. Maintain 2-3 cm standing water 2-3 days prior to uprooting.

Main field preparation

For the preparation of the main plot, the following points should be kept in mind-

- The field should be prepared thoroughly by plowing with a desi plow 4 times, followed by harrowing and laddering.
- Ploughing should be started at least 2-3 weeks ahead of transplanting so that weeds are dried up/ decayed.
- Alternatively, one pass of moldboard plow followed by one or two passes of modified helical blade puddler are sufficient for obtaining good quality puddled soil.
- If available, compost or manure should be applied uniformly prior to field preparation and should be mixed with soil.
- Bunds are to be repaired to reduce water losses from the field during the cropping season.
- The basal fertilizer dose is to be applied to the field.

Transplanting

- **Seedling age-** 30-35 for long duration, and 20-25 days for medium duration rice varieties for transplanting in the main field.
- **Spacing-** 20-25 cm × 15 cm
- **Seedling density-** 2-3 seedlings per hill.
- **Depth of seedling-** 4-5 cm.

Nutrient management: Transplanted aromatic rice, fertilizer recommendation per hectare is 40-20-20-5: N-P₂O₅-K₂O-ZN. The nitrogen is applied into 3 equal spits i.e. 1/3rd at tillering, and 1/3rd at panicle initiation (PI).

Weeding

The field weed free, especially early season. Weeds do most damage in the early crop stage, but later control is also important to prevent the seed setting of weeds.

- 1st weeding with paddy weeder or hoe, 3 weeks after transplanting.
- 2nd weeding with paddy weeder or hoe, 6 weeks after transplanting.
- Pre-emergence herbicides- pretilachlor 50 % EC, oxadiargyl 80% WP.
- Post-emergence herbicides- Bispyribac sodium 10% EC, Pyrazosulfuron Ethyl 10% WP

Irrigation: In the Sali season, in the absence of rain, the application of 5 cm irrigation water 3 days after the disappearance of ponding water is recommended in medium and heavy soils.

Plant protection measures

- The insect-pest, and disease prevention in different districts of Assam includes stem borer, leaf folder, swarming caterpillar, Gandhi bug, blast, brown spot, false smut, bacterial blight, etc. The management practices include cultural, mechanical, biological, and chemical methods. Chemical use is advised only when the pest population exceeds the economic threshold Level (ETL).
- Major insect-pest- stem borer, leaf folder, rice Gandhi bug, caseworm, etc.
- Major disease- brown spot, blast, bacterial leaf blight, false smut, etc.

Harvest and post-harvest

- Harvest when 80-85 % of the grains attain physiological maturity i.e. visually straw-coloured.
- Minimize the time during which the harvested plants remain in the field, and avoid field drying.
- Thresh and dry within two days after harvesting. Sun drying is best on a mat or plastic sheet, keeping the thickness of the grain layer at 3 to 5 cm.
- Clean thoroughly, by winnowing. Store the rice in a cool, dry, and clean area. Grain should be dried to 12-14 % moisture before storing hermetically to avoid re-entering

moisture in the grain. For seed purposes; dry to a moisture level of <12% and <9% to store for up to 1 year.

- Milling should be done when there is a demand for rice. Rice milling should be done 3 months after harvesting to ensure good quality traits like amylose content. To reduce broken percentage in milling; above mentioned practices of harvesting, threshing and drying should be followed.

Summary

Rice is a widely grown staple food crop for half of the world's population. Assam being one of the centres of origin has got wide range of variation of rice cultivars. Among all rice cultivars, Joha rice is the most popular cultivar in this region. The Joha rice cultivars are known for their unique aroma, superfine kernel, good cooking qualities, and excellent palatability. Joha rice of Assam have compatible aroma and quality as that of other rice of India. Joha rice is favored for its short growth cycle and adaptability to local conditions. Joha rice cultivation involves traditional organic farming practices, decreasing the need for chemical fertilizers and pesticides. Challenges facing for Joha rice cultivation such as pest and disease management and the need of better irrigation. Overall, Joha rice cultivation is an economically and environmentally sustainable option for farmers.