e-ISSN:2582 - 7219

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 4, Issue 6, June 2021

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 5.928

International Journal Of Multidisciplinary Research In Science, Engineering and Technology (IJMRSET)

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 5.928

| Volume 4, Issue 6, June 2021 |

Growth Characteristics and Yield Evaluation of Paddy (*Oryza Sativa* L.) Promising Selections under Rainfed Condition in Bindhyan Areas

Dr. Ratnakar Pandey[1], Dr. PK Singh[2], Dr. VB Singh[3] & Dr. SS Kashyap[4]

SMS (GPB), KVK, Sonbhadra, A.N.D. University of Agric. & Tech., Ayodhya (UP), India[1]

Senior Scientist & Head, KVK, Sonbhadra, A.N.D. University of Agric. & Tech., Ayodhya (UP), India [2]

SMS (GPB), KVK, Sant Kabir Nagar, A.N.D. University of Agric. & Tech., Ayodhya (UP), India [3]

Assistant Professor/ SMS, Sant Kabir Nagar, A.N.D. University of Agric. & Tech., Ayodhya (UP), India [4]

ABSTRACT: *Oryza Sativa*, it is believed, is associated with wet, humid climate, though it is not a tropical plant. It is probably a descendent of wild grass that was most likely cultivated in the foothills of the far Eastern Himalayas. Another school of thought believes that the rice plant may have originated in southern India, then spread to the north of the country and then onwards to China. It then arrived in Korea, the Philippines (about 2000 B. C.) and then Japan and Indonesia (about 1000 B. C.). When Alexander the Great invaded India in 327 B. C., it is believed that he took rice back to Greece. Arab travelers took it to Egypt, Morocco and Spain and that is how it travelled all across Europe. Portugal and Netherlands took rice to their colonies in West Africa and then it travelled to America through the 'Columbian Exchange' of natural resources. But as is traditionally known, rice is a slow starter and this is also true to the fact that it took close to two centuries after the voyages of Columbus for rice to take root in the Americas. Thereafter the journey of rice continues with the Moors taking it to Spain in 700 A. D. and then the Spanish brought rice to South America at the beginning of 17th century. India is an important centre of rice cultivation. The rice is cultivated on the largest areas in India. Historians believe that while the indica variety of rice was first domesticated in the area covering the foothills of the Eastern Himalayas (i.e. north-eastern India), stretching through Burma, Thailand, Laos, Vietnam and Southern China, the japonica variety was domesticated from wild rice in southern China which was introduced to India. Perennial wild rice still grow in Assam and Nepal. It seems to have appeared around 1400 BC in southern India after its domestication in the northern plains. It then spread to all the fertiled alluvial plains watered by rivers. Some says that the word rice is derived from the Tamil word arisi. Rice is first mentioned in the Yajur Veda (c. 1500-800 BC) and then is frequently referred to in Sanskrit texts. In India there is a saying that grains of rice should be like two brothers, close but not stuck together. Rice is often directly associated with prosperity and fertility; hence there is the custom of throwing rice at newlyweds. In India, rice is always the first food offered to the babies when they start eating solids or to husband by his new bride, to ensure they will have children.

I. INTRODUCTION

Uttar Pradesh is a northern State and located between 23°52'N and 31°28'N latitudes and 77°3' and 84°39'E longitudes. Garlanded by the Ganga and Yamuna, the two auspicious rivers of Indian mythology, Uttar Pradesh is surrounded by Bihar in the East, Madhya Pradesh in the South, Rajasthan, Delhi, Himachal Pradesh and Haryana in the west and Uttaranchal in the north and Nepal touch the northern borders of Uttar Pradesh. For administrative purposes it is divided into 19 divisions. There are 123950 villages and 753 cities spread across 83 districts. The population of Uttar Pradesh in 2001 was 166052859 comprising of 87466301 males and 78586558 females. It formed 16.16% of India's population. Population density in the State was 689/km^2.

Bindhyan Zone of Uttar Pradesh - Mirzapur and Sonbhadra districts of Uttar Pradesh are the Bindhyan sub-zone of the Middle Gangetic Plain zone. Rainfall is adequate at about 1,134 mm; the climate is similar to the other parts of the eastern plains of Uttar Pradesh. However, the region has a very high forest cover of about 40% of the land. Less than a third of this land is cultivated and only a third of this is irrigated.[1]

The climate of Uttar Pradesh is predominantly subtropical, but weather conditions change significantly with location and seasons. Depending on the elevation, the average temperatures vary from 12.5–17.5 °C (55–64 °F) in January to

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 5.928

| Volume 4, Issue 6, June 2021 |

27.5–32.5 °C (82–91 °F) in May and June. Rainfall in the State ranges from 1,000–2,000 mm (39–79 in) in the east to 600–1,000 mm (24–39 in) in the west. About 90% of the rainfall occurs during the southwest Monsoon, lasting from about June to September. With most of the rainfall concentrated during this four-month period, floods are a recurring problem and cause heavy damage to crops, life, and property, particularly in the eastern part of the state, where the Himalayan-origin rivers flow with a very low north-south gradient. In the Himalayan region of the State, annual snowfall averaging 3 to 5 metres (10 to 15 feet) is common between December and March. Periodic failure of monsoons results in drought conditions and crop failure.[2,3]

The total geographical area of Uttar Pradesh is 29.44 million hectare and the area under forest 1657023 hectare. The cultivable area is 24170403 hectare (82.1%of total geographical area) and the net area sown is 16573478 hectare (68.5% of cultivable area). The gross cropped area is 25.415 million hectare and the area sown more than once is 8.841 million hectare with the cropping intensity of 153.54 %. The net irrigated area is 13.313 million hectare (By canals- 25.18 %, by tubewells- 66.94% and by others – 7.88%). The gross irrigated area is 19.218 million hectare and the percentage of net irrigated sown area is 80.3%. The total number of land holdings are 224.57 lakhs out of which 175.07 lakh (78.0%) are marginal farmers, 31.03 lakh (13.8%) small farmers and 18.47 lakh (8.22%) farmers hold land above 2 hectare.

The soils in the region falling under Agro-climatic zone IV are alluvium-derived soils mostly khaddar (recent alluvium) and hangar (old alluvium). In some area the soil is highly calcareous. The soils are loamy and high in organic matter content. Rice, maize, pigeon pea, moong bean crops are common in kharif season. In post-rainy (rabi) season wheat, lentil, Bengal gram, pea, and sesame and at some places groundnut is grown on residual soil moisture with one or two supplemental irrigation. The important cash crops of the region are sugarcane, potato, tobacco, chillies, turmeric and coriander with supplemental irrigation. Rice–wheat cropping system is more predominant. [4,5]

The dominant soil landscapes, representing the northern plains, constitute gently to very gently sloping lands. In some area the soil is highly calcareous. The soils in general are neutral in reaction and have moderate clay and low organic carbon content. Traditionally rain fed and irrigated agriculture is common. The main crops grown are rice, maize, pigeon pea, sorghum, pearl millet, moong beans during kharif and wheat, Bengal gram, green peas, rapeseed and mustard and lentil during rabi season. Sugarcane is the main cash crop. Rice–wheat cropping system is more predominant.

II. DISCUSSION

The **Bindhyan areas** of the State although highly populated, should progressively adopt power farming for timely and precise field operation at reduced costs and to maximize utilization efficiencies of costly inputs and for conservation of natural resources. Precision land levelling and use of efficient irrigation equipment for economizing in water requirements of crops including diversification of crops suiting to water availability are important issues in the region. Gradual increasing in farm power availability from the present level of 1.75 kW/ha to about 2 kW/ ha by 2020 is necessary for timely farm operations. Mechanization of most of the agricultural operations through custom hiring of high capacity equipment is required so that marginal, small and medium categories of farmers can also take the advantage of mechanization. Crop residue management for feed, fodder and energy is also important. It is presumed that by 2020, about 70% of the tillage, land leveling, sowing/planting, irrigation and threshing of all the important crops will be fully mechanized and other operations for different types of crops will be mechanized upto about 25–30%. In U.P. sale of tractors is maximum. Last year maximum number of tractors about 73,000 tractors were sold in U.P. About more than 50 laser land leveler are being used on custom hire basis[6,7]

A six-row rice transplanter using mat type seedlings. The six row machine is a riding type and employs a double acting transplanting mechanism for enhanced transplanting speed and in turn high field capacity. The double acting transplanting mechanism is run with, one sun and four planetary gears. The machine has provision for adjustments of number of seedlings per hill, depth transplanting and hill-to-hill distance. The depth of transplanting is maintained constant, automatically -during transplanting. The row-to-row spacing is 300 mm and five setting of hill to-hill distance from 120 to 220 mm can be fixed depending on desired plant population. The machine is provided with six spare seedling racks for filling of trays intermittently. The machine is powered with a 12 hp air cooled petrol engine and it is provided with power steering. Depth of transplanting can be set from 15 to 45 mm. It is also available in walking type version and in some cases also provided with a seat.

Self-Propelled Vertical Conveyor Reaper : It is an engine operated, walk behind type harvester suitable for harvesting and windrowing cereals and oilseed crops. The reaper consists of engine, power transmission box, pneumatic wheels, cutter bar, crop row dividers, conveyor belts with lugs, star wheels, operating controls and a sturdy

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 5.928

| Volume 4, Issue 6, June 2021 |

frame. The engine power is transmitted to cutter bar and conveyor belts through belt pulleys. During forward motion of the reaper, crop row dividers divide the crop, which come in contact with cutter bar, where shearing of crop stems takes place. The cut crop is conveyed to one side of the machine by the conveyor belt fitted with lugs and is windrowed in the field. The crop is bundled manually and transported to threshing yard. There are no shattering losses due to vertical conveying of the crop.[8,9]

Self-Propelled Combine Harvester: The combine harvester consists of cutting unit, threshing unit and cleaning and grain handling units. The cutting section includes reel, cutter bar, an auger and a feeder conveyer. Threshing section has threshing cylinder, concave and cylinder beater. The cleaning section mainly consists of walker, chaffer sieve, grain collection pan. The grain handling section consists of a grain elevator and a discharge auger. The crop after being cut is delivered to the cylinder and concave assembly through feeder conveyor where it is threshed and the grains and straw is separated in different sections. The grain can be directly loaded into the trolley.

III. RESULTS

Axial-Flow Paddy Thresher : It consists of a threshing cylinder, concave, cylinder casing, cleaning system and feeding chute. In axial flow concept, the crop is fed from one end, it moves axially and the straw is thrown out from the other end after complete threshing of the crop. During threshing, the crop rotates three and half times around the cylinder and all the grains get detached. The threshing cylinder is of peg type. The casing of the thresher has 7 louvers for moving the crop axially. Two aspirator blowers and two sieves are provided for cleaning the grain.[10]

Basmati Rice means the rice varieties possessing aroma and gives pleasant flavour after cooking. 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. The Basmati rice is also stated to be the Pearl of Rice. These superfine best quality 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.
The important varieties of Basmati rice as notified under the seeds Act, 1966 are Basmati 386 ,

Basmati 217 , Ranbir Basmati , Karnal Local/ Taraori Basmati, Basmati 370, Type-3 (DehradooniBasmati), Pusa Basmati-1, Pusa Basmati 1121, Punjab Basmati-1, Haryana Basmati- 1, Ranbir Basmati (IET-11348),Kasturi and Mahi Sugandha.[11,12]

Selection of Seeds -The use of quality seeds in cultivation of rice is an important factor to get better crop yield. Therefore, proper care has to be taken in selecting seeds of the best quality. Much of the success in raising the healthy seedlings depends on the quality of seed. Seeds intended for sowing should satisfy the following requirements :- a. The seed should belong to the proper variety, which is proposed to be grown. b. The seed should be clean and free from obvious mixtures of other seeds. c. The seed should be mature, well developed and plump in size. d. The seed should be free from obvious signs of age or bad storage e. The seed should have a high germinating capacity. Before sowing the seed should be treated with fungicides which protects the seed against soil-born fungi and also give a boost to the seedlings. Before transplanting, field should be puddled properly with bullock or tractor drawn puddlers. Puddling is a very important operation in transplanted rice. Puddling helps to kill the weeds and buries them in puddled soils. It also suppresses the germination of weeds in subsequent growing period of crop. Puddling keeps the soil surface in a more even condition, besides creating beneficial physical, biological and chemical conditions for rice plant growth. Transplanting should be done with proper age of seedlings. In case of short duration varieties, the seedlings should be uprooted from the nursery beds for transplanting , when it is three to four weeks old. In case of medium and long duration varieties, four to five weeks old seedlings should be transplanted. Always healthy seedlings should be used for transplanting at the four to five leaf stage or when they are. Depth of planting has assumed considerable importance after the introduction of high yielding varieties. The high yielding varieties are characterized with high tillering capacity. The high tillering potential of these varieties is, however, best expressed with shallow planting. The tiller buds formed at the basal node are not suppressed in case of shallow plantings . Therefore, the seedlings should be transplanted at 2 to 3 cm depth. Shallow planting gives better yields. The deeper planting results in an increased height of the plants besides delays and inhibits tillering. The crop planted with rows running in the north-south direction generally gives better yield particularly in rabi season. The adoption of this practice is worthwhile, since it does not involve any extra expenditure.[13,14]

Organic manures are as much as important for rice cultivation as inorganic fertilizers. In case of upland rice cultivation, the use of bulky organic manure is very much desirable in order to maintain the physical condition of the soil and also to increase the water holding capacity of the soil for maximum utilization of rain water. In upland fields

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 5.928

| Volume 4, Issue 6, June 2021 |

10-15 tonnes of well rotted Farm Yard Manure or compost should be applied in one hectare area preferably 4 to 6 weeks before sowing. Organic manures should be spread evenly on the upper surface of the soil and ploughed in to get it well mixed in the soil.

Application of chemical fertilizers depends basically upon (i) fertility states of the field and (ii) previous crop grown and amount of organic manure applied. Before deciding the fertilizer dose, soil is required to be got tested to know the status of the nitrogen, phosphorus and potassium in the soil. After testing the soil, fertilizer dose should be calculated accordingly.

The water requirement of rice crop is comparatively higher than any other crop of the similar duration. Assured and timely supply of irrigation water has a considerable influence on the yield of the crop. During the crop growth period, the water requirement is generally high at the initial seedling establishment stage. After the transplanting , water should be allowed to stand in the field at a depth of two to five centimeters till the seedlings are well established. The second, the most important critical stage is tillering to flowering and in this period the crop should not be subjected to soil moisture stress. The water supply should be ensured in required amount during panicle initiation to flowering stage. About five centimeters depth of water should be maintained in the field up to the dough stage of the crop. Before harvesting, water should be drained out from the field to allow quick and uniform maturity of grain.

The maximum quantity and better quality paddy and rice depend on the harvesting of the crop at the correct maturity stage. Therefore, it is of the paramount importance to harvest the crop at suitable time. Harvesting of the crop when it is not fully matured might result in loss of yield with poor quality grains. If harvesting is delayed, grain may be lost due to damage by rats, birds, insects, shattering and lodging. Thus, timely harvesting ensures better yield, good quality of grains, consumer acceptance and less breakage when milled. The right stage for harvesting as commonly understood by laymen is when panicles turn into golden yellow and the grains contain about 20 percent moisture. When the moisture in the paddy grains reaches 16-17 percent in the standing crop in the fields, the crop sustains a heavy loss owing to shattering and damage by birds and rodents. Extensive studies have been carried out on specifying the optimum time of harvesting. Based on the results of the various studies, in general, three criteria are taken into consideration to specify the right time of harvesting viz. (i) the moisture content of the grains, (ii) the number of days after planting or flowering and (iii) the dry matter of the plant or seed. The most common and old methods of threshing of paddy is trampling by bullocks or lifting the bundles and striking them on the raised wooden platform. Now pedal threshers are being used. Power driven stationary threshers are also used for quick threshing.[15]

IV. CONCLUSION

Harvesting, drying and storage- Grain must be dried to at least 14% moisture (wet basis) and seed grain should be dried to12% moisture before storage. Grain needs to be harvested and dried so that it will not cause cracking of the grain, as cracked grains are easier for insects to infest. This requires:

Harvesting and threshing at the correct stage of maturity (20-25% moisture content)

- Drying the grain at a rate and temperature that will not damage the grain. The first stage of drying

- from 25% moisture to 18% can be done at high temperatures e.g. above 50-60o C. After this the grain needs tempering or cooling for at least 4 hours.

Drying from 18% to 14% moisture should be much slower and the temperature should not exceed 42º C. When sun drying, the grain should be spread in thin layers, 2-5cm, and turned every 1-2 hours. When sun-drying seed, the grain should be turned more often and not exposed to temperatures above 42º C. If high temperatures occur the seed should be dried in the shade. New grain should not be stored near older grain unless all insects have been eliminated from the older grain. It is preferable to store grain as paddy or rough rice as this is less susceptible to insect attack than milled rice. Parboiled rice is also less susceptible to damage than raw rice. **Grain stores** must have a damp proof floor and have waterproof walls and roof. It is preferable to be able to seal the storage so fumigation is possible should the need arise. Sealing the storage also helps exclude rodents and birds. Where grain is to be stored in bags, the bags should be stacked on pallets at least 50cm away from the walls. Hermetic storage systems have proved to be an effective means of storing grain.[15]

Block demonstration of rice: The objective of the demonstration is to improve seed replacement rate, promote line sowing/ planting coupled with promotion of plant nutrient and plant protection technologies. Quality seed recommended for the area would be promoted to cover entire area of the unit. Package of practices proposed for

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 5.928

| Volume 4, Issue 6, June 2021 |

scientific crop management under the demonstrations for different ecologies of rice along with physical and financial targets to the states are given respectively. It is proposed to promote hybrid rice technologies in 40 units of 1000 hectares each. Every farmer in these units would be encouraged to take up at least 0.40 hectares under hybrid rice. In case of rice, identified progressive farmers for a set of 100 hectares each, will be provided two drum seeders free of cost which will be used for facilitating the sowing of rice lines by all the farmers included in the unit. It is expected that concept of custom hiring in the area would be popularized while at the same time it would give additional incentive to the identified progressive farmers for coordinating various implementation activities

REFERENCES

1. Adhikari TB, Mew TW, Teng PS. Progress of bacterial blight on rice cultivars carrying different *Xa* genes for resistance in the field. *Plant Dis.* 1994;**78**:73–77. doi: 10.1094/PD-78-0073. [CrossRef] [Google Scholar]
2. Ahmadi N, Albar L, Pressoir G, Pinel A, Fargette D, Ghesquiere A. Genetic basis and mapping of the resistance to Rice yellow mottle virus. III. Analysis of QTL efficiency in introgressed progenies confirmed the hypothesis of complementary epistasis between two resistance QTLs. *Theor Appl Genet.* 2001;**103**:1084–1092. doi: 10.1007/s001220100642. [CrossRef] [Google Scholar]
3. Alam SN, Cohen MB. Detection and analysis of QTLs for resistance to the brown planthopper, *Nilaparvata lugens*, in a doubled-haploid rice population. *Theor Appl Genet.* 1998;**97**:1370–1379. doi: 10.1007/s001220051031. [CrossRef] [Google Scholar]
4. Anantha MS, Patel D, Quintana M, Swain P, Dwivedi JL, Torres RO, Verulkar SB, Variar M, Mandal NP, Kumar A, Henry A. Trait combinations that improve rice yield under drought: Sahbhagi Dhan and new drought-tolerant varieties in South Asia. *Crop Sci.* 2016;**56**:408–421. doi: 10.2135/cropsci2015.06.0344. [CrossRef] [Google Scholar]
5. Ballini E, Berruyer R, Morel JB, Lebrun MH, Notteghem JL, Tharreau D. Modern elite rice varieties of the 'Green Revolution' have retained a large introgression from wild rice around the Pi33 rice blast resistance locus. *New Phytol.* 2007;**175**:340–350. doi: 10.1111/j.1469-8137.2007.02105.x. [PubMed] [CrossRef] [Google Scholar]
6. Bao JS, Wu YR, Hu B, Wu P, Cui HR, Shu QY. QTL for rice grain quality based on a DH population derived from parents with similar apparent amylose content. *Euphytica.* 2002;**128**:317–324. doi: 10.1023/A:1021262926145. [CrossRef] [Google Scholar]
7. Bastiaans L, Roumen EC. Effect on leaf photosynthetic rate by leaf blast for rice cultivars with different types and levels of resistance. *Euphytica.* 1993;**66**:81–87. doi: 10.1007/BF00023511. [CrossRef] [Google Scholar]
8. Berruyer R, Adreit H, Milazzo J, Gaillard S, Berger A, Dioh W, Lebrun MH, Tharreau D (2003) Identification and fine mapping of *Pi33*, the rice resistance gene corresponding to the Magnaporthe grisea avirulence gene *ACE1*. Theor Appl Genet 107:1139–1147 [PubMed]
9. Bimpong IK, Serraj R, Chin JH, Ramos J, Mendoza EMT, Hernandez JE, Mendioro MS, Brar DS (2011) Identification of QTLs for drought-related traits in alien introgression lines derived from crosses of rice (*Oryza sativa* cv. IR64) x *O. glaberrima* under lowland moisture stress. J Plant Biol 54:237–250
10. Bligh HFJ, Larkin PD, Roach PS, Jones CA, Fu HY, Park WD. Use of alternate splice sites in granule-bound starch synthase mRNA from low-amylose rice varieties. *Plant Mol Biol.* 1998;**38**:407–415. doi: 10.1023/A:1006021807799. [PubMed] [CrossRef] [Google Scholar]
11. Bligh HFJ, Till RI, Jones CA. A microsatellite sequence closely linked to the *waxy* gene of *Oryza sativa*. *Euphytica.* 1995;**86**:83–85. doi: 10.1007/BF00022012. [CrossRef] [Google Scholar]
12. Brennan JP, Malabayabas A (2011) International Rice Research Institute's contribution to rice varietal yield improvement in South-East Asia. ACIAR impact assessment No. 74. Australian Centre for International Agricultural Research, Canberra
13. Cada EC, Escuro PB. *Rice varietal improvement in the Philippines.* Los Baños: Rice breeding. International Rice Research Institute; 1972. pp. 161–166. [Google Scholar]
14. Cairns JE, Acuna TLB, Simborio FA, Dimayuga G, Praba ML, Leung H, Torres R, Lafitte HR. Identification of deletion mutants with improved performance under water-limited environments in rice (*Oryza sativa* L.) *Field Crop Res.* 2009;**114**:159–168. doi: 10.1016/j.fcr.2009.07.019. [CrossRef] [Google Scholar]
15. Calingacion M, Fang L, Quiatchon-Baeza L, Mumm R, Riedel A, Hall RD, Fitzgerald M. Delving deeper into technological innovations to understand differences in rice quality. *Rice.* 2015;**8**:1–10.

INNO SPACE
SJIF Scientific Journal Impact Factor
Impact Factor: 5.928

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

निस्केयर NISCAIR

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

9710 583 466 9710 583 466 ijmrset@gmail.com

www.ijmrset.com