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Physio-chemical, Properties, Adoption and Productivity of Some Fine (Basmati) Rice Varieties in Dera Ismail Khan

Inayat Ullah Awan, Muhammad Zubair Sulamani, Khalil Ahmed and M. Safdar Baloch
Department of Agronomy, Faculty of Agriculture, Gomal University, D.I. Khan, Pakistan

Abstract

The study was aimed at evaluating the performance of five Basmati rice varieties tasted at the Agronomic Farm, Gomal University, Dera Ismail Khan, during 1997. Variety Basmati-385 out yielded rest of the varieties by yielding 3.98 t ha^{-1} of paddy with maximum normal kernels (77.82%) and lowest sterility (33.28%). It was followed by Basmati-370 on all the parameters studied. Varity C-6129 was highest in straw yield and 1000-seed weight. Variety Basmati-198 didn't perform well having statistically the lowest score in most of the recorded characters. Amongst these varieties, the productivity and adoption of Basmati-super 385 was remarkable. Although it was also praiseworthy for physicochemical properties yet it was superceeded by Basmati-super on account of slight differences. On the basis of these results, Basmati-385 is recommended for promising yield and Basmati-super for the quality attributes.

Keywords: Rice, Fine, varieties, Quality, D.I. Khan

Introduction

Rice (*Oryza sativa* L.) Is an important cereal crop of Pakistan. Globally it ranks second to wheat in terms of area harvested. In Asian diets, milled rice provides 40-80 percent of the calories and at least 40 percent of the protein. One hectare of rice can sustain 5.7 persons for a year compared to 5.3 for maize and 4.1 for wheat (Zia *et al*., 1986).

Aroma is the most important criterion for distinguishing Basmati from non-Basmati rice (Vivekanandan and Giridhara, 1994) and virtually Pakistan has the distinction of producing and exporting world's finest quality Basmati rice which is known for its good aroma, taste and elongation on cooking. For these quality Basmati rice fetches a very high premium in home as well as foreign markets and its cultivation is gaining momentum. In Pakistan during the year 1996-97 rice was planted on 790 thousands hectares with total production of 4.035 million tonnes (Nasir and Hyder, 1998). Basmati rice gradbbed 53% of the total areas specified for rice crop Pakistan and earned 14025.6 million rupees as a foreign exchange (Khan, 1997).

Due to the large acreage commanded by Chashma Right Bank Canal (CRBC) and availability of all necessary inputs, the rice crop has got a great potential and popularity among the farmers of D.I. Khan. Selection of high yielding variety of rice is one of the pre-requisites for popularizing the rice cultivation in the area. The research is always required to select the more suitable variety of crop for the area. In this context, present study was designed, to asses the performance, suitability and potential of Basmati varieties under the agro-ecological conditions of D.I. Khan, so that farmers and local people can enjoy the benefit from the aromatic rice varieties besides other IRRI varieties already in practice.

Materials and Methods

The trial field was prepared at the Agronomic Research Farm, New Campus, Gomal University, Dera Ismail Khan, Varieties included in the experiment were Basmti-385, Basmati-370, Basmati 198, Basmati super and C-6129. The experiment was laid out in a randomized complete block design (RCBD) having four replications with a net plot size of 1×1 m^2 for data collection. The field was thoroughly prepared by giving one deep ploughing followed by two with cultivator including a planking. The seed for the five Basmati varieties was sown in nurseries at one week interval.

Two seedings/hill were transplanted by following the same schedule. Fertilizer was applied at the rate of 90:60 kg NP ha^{-1} in the form of urea and triple super phosphate. Row to row and plant to plant distance was kept at 20 cm each. For the control of stem borer, Agridan granules 20 kg ha^{-1} were a week before panicle initiation. Irrigation was given weekly. Weeding was carried out uniformly depending upon the requirement of the varieties planted.

Data were analyzed by using analysis of variance techniques (Steel and Torrie, 1980) and LSD Range test at 5% level of probability was applied to see the differences among varieties.

Results and Discussion

The rice varieties showed highly significant differences in days to maturity and number of panicles/m^2 (Table 1). Among the five cultivars, Basmati super and Basmati-385 took 118 and 119 days to maturity and designated as early maturing, while Basmati-198 constituted as late maturing by taking 136 days to maturity. Maximum number of Panicles/m^2 were observed in Basmati-198 (184.8) followrd by C-6129 and Basmati-385, which produced 174 and 168 panicels/m^2 (138.3) and ranking statistically at the bottom among all varieties included in the experiment.

Perusal of data relating to 1000-grain weight and normal kernels percentage presented in Table 2 released statistically significant differences as affected by the varieties. Variety C-6129 produced the heaving seed weight of 23.20 g, whereas-Basmati-198 produced statistically the

lowest grain weight by giving 18.35 g per 1000-kernels than the rest-of the varieties including in the experiment. The percentage of normal kernels varied from 77.82 to 56.70. Variety Basmati-385 produced highest percentage of normal kernels (77.82) and therefore produced the highest of paddy yield. It was statistically equivalent to Basmati-370 with 77.65 percent of normal kernels. Variety Basmati-198 produced the lowest percentage (56.70) of normal kernels.

Table 1: Days to maturity and number of panicles/m^2 as affected by fine (Basmati) rice varieties

Varieties	Days to maturity	Panicles/m^2
Basmati-385	119d	168ab
Basmati-370	130b	138c
Basmati-Super	118e	159bc
C-6129	127c	174ab
Basmati-198	136a	184a

Values following by same letter do not differ significantly by LSD at 5% probability level

Table 2: 1000-grain weight (g) and normal kernels (%) as affected by fine (Basmati) rice varieties

Varieties	1000-grain weight (g)	Normal kernels (%)
Basmati-385	21.15b	77.82a
Basmati-370	19.95b	77.65a
Basmati-Super	20.52b	73.25b
C-6129	23.20a	64.45c
Basmati-198	18.35c	56.70d

Values following by same letter do not differ significantly by LSD at 5% probability level

The varieties evaluated differ significantly from one another for the paddy and straw yield. Basmati-385 out-yielded (3.98 t ha^{-1}) other varieties regarding paddy yield (Table 3). It was following by Basmati-370, Basmati Super and C-6129 which yielded 3.72, 3.20 and 2.77 t ha^{-1}, respectively. Variety Basmati-198 gave the lowest economic yield of 2.22 t ha^{-1}. It was observed that varieties which repened earlier produced more paddy yield that the late maturing ones. The straw yield was found maximum in variety C-6192 (33 t ha^{-1}) which was at per with Basmati-198 (30.75 t ha^{-1}).

The lowest straw yield of 23 and 24 t ha^{-1} was produced in Basmati-370 and Basmati super. The increase in straw yield is the net result of positive correlation of characters like plant height, number of tillers/plant, number of plant/unit area and length of panicle. There were some interesting results in the present experiment that cultivars showing the highest straw yield produced the lowest paddy yield. This indicates that straw yield is negatively correlated with paddy yield. The cultivars pertaining a greater part of the photo assimilate towards the economic yield produced the highest yield. These findings are in close conformity with Mann (1987) and Wohuinangu and Sajjad (1992) who compare serval varieties of Basmati rice and concluded that variety Basmati-385 was high yielding among all by producing average yield of 4 t ha^{-1}.

Table 3: Paddy and straw yield (t ha^{-1}) as affected by fine (Basmati) rice varieties

	Yield (t ha^{-1})	
Varieties	Paddy	Straw
Basmati-385	3.98a	27.25b
Basmati-370	3.72b	23.00c
Basmati-Super	3.20c	24.00c
C-6129	2.77d	33.00a
Basmati-198	2.22e	30.75a

Values following by same letter do not differ significantly by LSD at 5% probability level

Table 4: Physicochemical characteristics of paddy samples

Character	Basmati-385	Basmati-370	Basmati-Super	Basmati C-6192	Basmati-198
Brow Rice (%)	79.2	78.70	78.1	77.2	79.0
Total Milled Rice (%)	70.1	70.10	70.1	70.1	70.1
Head Rice (%)	53.3	52.70	50.5	50.9	52.3
Grain breadth (mm)	6.81	6.63	7.34	7.20	6.62
Grain breadth (mm)	1.62	1.61	1.63	1.65	1.61
Grain thickness (mm)	1.53	1.52	1.56	1.56	1.53
L/B ratio	4.21	4.12	4.52	4.38	4.11
Quality Index	2.76	2.72	2.90	2.82	2.69
Gain size	Long	Long	E.Long	E.Long	Long
Gain shape	Slnd	Slnd	Slnd	Slnd	Slnd
Gain type	Fine	Fine	Fine	Fine	Fine
Cooked grain length (mm)	12.80	12.53	14.07	13.61	12.11
Elongation ratio	1.88	1.89	1.92	1.89	1.83
Amylose content (%db)	20.1	20.60	20.5	20.6	20.8
Alkali spreading value	3.3	3.40	3.4	3.4	3.2
Gelatinization (°C)	77.0	75.00	75.0	75.0	78.0
Stickiness core (1-5)	3.5	3.50	3.9	3.9	3.3
Aroma score (1-5)	3.2	2.50	2.4	2.1	2.1
Volume expansion ratio	5.0	5.40	5.4	5.2	4.5
Water absorption ratio	4.2	4.10	4.6	4.4	4.1

All values are average of two determinations
E.Long = Extra Long
Stickiness score 1 = Sticky and 5 = Well separated
Slnd = Slender, Armoa score 1 = Absent and 5 = Strong

The physicochemical characteristics of paddy samples (Table 4) revealed that there were very little differences among all the varieties but however, variety Basmati super was leading in most of the quality attributes like grain length quality index, grain size, grain shape, grain type, cooked grain length, elongation ratio, stickiness score, volume expansion ratio and water absorption ration. Panwar *et al*. (1991) reported that the grains of Basmati super were long and slender with higher hulling and milling recovery than those of Basmati-385 and Basmati-370. Grain elongation after cooking was 1.76 with 25.4 percent amylose content.

Conclusion: Variety Basmati-385 proved best in most of the parameters recorded in the investigation is hereby recommended for general cultivation, under the agro-ecological conditions of Dera Ismail Khan.

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