Pak J. Bot., 10 (2) 209 - 213, 1978.

POSSIBILITY OF GROWING TWO RICE CROPS IN ONE SEASON

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Abstract:

The possibility of growing two rice crops in the same field during one season has been explored. An early maturing photoperiod insensitive variety of fine Basmati rice namely Kashmir Basmati was used as the experimental material. The first crop of this variety was transplanted in the first week of May and harvested in the third week of August Subsequently, the second crop was transplanted in the same field during the fourth week of August and was harvested in the third week of November, thus leaving sufficient interval for the timely sowing of wheat crop in the same field. The grain yield of first and second crop was 2511.7 and 2610.5 kg/ha respectively. The results of this experiment indicate that Basmati yield can be doubled by growing two rice crops in one season.

Introduction

Adaptation of intensive cropping pattern is one of the key solutions to bridge the widening gap of grain production and consumption in a developing country like Pakistan. Rice, the second most important cereal crop after wheat, occupies an area of 1.78 million hectares from which 2.74 million tons of rice is produced annually. In the province of Punjab, which is famous for the cultivation of fine varieties of rice, it is grown on an area of 0.93 million hectare out of which 70% area is under Basmati varieties. The total production of rice in Punjab is only 1.32 million tons. In order to break the production bottle-necks and to increase the rice production in the country without increasing the area under cultivation, it is essential to practice double cropping with short duration varieties. In Pakistan, earlier efforts by the rice scientists to grow two rice crops in one season proved unsuccessful mainly due to the non-availability of short duration varieties. With the traditional long duration varieties, a high degree of panicle sterility in the first crop and poor growth in the second crop was observed. There are evidences in the literature (Grist, 1968) where mention has been made several times about the successful practicing of double cropping in various rice growing countries of the world. Ratooning of rice has also been tried in many countries such as, India (Gupta & Mitra, 1948, Reddy & Pawar, 1959; Balasubramanian *et al.* 1970), Japan (Ishikawa, 1964) USA (Evatt, 1958, 1966; Evatt & Beachell, 1960), and Colombia (Sanchez & Cheaney, 1973). Radiation induced early maturing, fine grain Kashmir Basmati variety (Awan *et al.* 1977) stimulated the authors to explore the possibility of growing two consecutive crops of rice with it. The present studies describe the successful attempts of double cropping.

Materials and Methods

A short duration Basmati variety namely Kashmir Basmati (Awan *et al.* 1977) was used as the experimental material in these studies. For the first crop, dry seeds were sown in a well prepared seed bed in the first week of April. The seedlings were transplanted in the main plots after 30 days of nursery sowing. The field design of the experiment was a randomised complete block with three replications. The size of the plot in each replication was 11.50 m x 3.0 m. Planting distance was 22 x 22 cm. in both the crops. The plots were fertilized with 67.25 Kg. N/per hectare and were irrigated twice a week. All other normal cultural practices were given to the crop. Date of flowering was regularly recorded and nursery for the second crop was sown in the 3rd week of July i.e. immediately after hundred percent flowering in the first crop was noticed. The first crop was harvested in the 3rd week of August. The plots were again prepared and the seedling of the second crop were transplanted by the end of August. All the other treatments were similar for the second crop. Number of days from nursery sowing to panicle emergence were noted to determine the flowering period. At maturity, data with respect to plant height, tillers per plant, panicle length, spikelets per panicle, panicle fertility, 1000 grain weight and yield per hectare were recorded in both the crops.

A ratoon crop was also grown. At maturity, first crop was harvested at a cutting height of 15 cm and the plots were irrigated. The ratooned crop was also fertilized at the rate of 67.25 Kg. N/hectare.

Table 1. Mean values of various characteristics of Kashmir Basmati in double cropping experiments (three years average 1975–1977).

Characteristics	First crop		Second crop		Ratoon crop	
Days from seeding to flowering	99.3	b*	97.0	b	60.0	a
Plant height (cm)	148.7	c	122.8	a	138.7	b
No. of productive tillers/hill	16.0	b	12.4	a	22.9	c
Panicle length (cm)	28.1	c	25.5	b	24.1	a
No. of spikelets/panicle	123.2	c	109.1	b	71.4	a
Fertility %	74.0	a	91.3	b	92.7	c
1000 grain weight (gm)	19.1	a	20.8	b	21.1	b
Yield (Kg/ha)	2511.7	a	2610.5	a	3283.1	b

*Values with a common letter within a single character are not significantly different at 5% level.

Results and Discussions

Results of the double cropping experiment measured in terms of flowering period, plant height, tiller number per plant, panicle length, spikelets per panicle, panicle fertility percentage, 1000 grain weight and grain yield per hectare of Kashmir Basmati in individual crop are presented in Table 1. Plant height, tiller number per plant, panicle length and spikelets per panicle decreased in the second crop whereas a significant increase in panicle fertility percentage and 1000 grain weight over the first crop was observed. Number of days from seeding to flowering of both the crops were non significantly different. A slight increase, although non significant, in the grain yield level of the second crop as compared to that of first crop indicates that the lower temperature during the reproductive phase of the second crop has tended to increase the yield of the second crop. Higher values of panicle fertility and 1000 grain weight of the second crop seems to have contributed towards increasing the grain yield.

Reduction in the plant height, tiller number per plant, pancile length and spikelets per panicle of the second crop could be the result of relatively low temperature (Table 2) during the vegetative and reproductive phases of the second crop. Stunting of plant height, tillering and degeneration of florets at tips of panicle has been attributed to low temperature (Kaneda & Beachell, 1972). Aziz (1960) also observed a significant difference in the plant height of season fixed varieties with delayed transplanting. Higher temperature during the panicle emergence period of the first crop has resulted in the lower value of panicle fertility percentage. This also confirms the earlier findings (Aziz, 1960) that early transplanting reduced the number of filled grains in Basmati-370. A significant increase in the panicle fertility and 1000 grain weight of the second crop suggest that the delayed transplanting did not arrest the grain fillings as reported by (Aziz, 1960). Moreover, increase in the mean value of these two characters has compensated the yield potential of the second crop which is reflected in a slightly higher grain yield. The results of the ratoon crop (Table 1 last column) show that the crop matures within 60 days after the harvest of the first crop. A reduction in the plant height was also noticed due to which the crop became more responsive to nitrogen fertilizer and the result of which is reflected in the higher grain yield of the ratoon crop. Although the mean values of the panicle length and number of spikelets per panicle were lower in the ratoon crop as compared to those of the first and the second crop yet, the grain yield per hectare of the ratoon crop was much higher than the grain yield of the first and the second crop. The higher grain yield of the ratoon crop is mainly due to higher value of panicle fertility, tiller number per plant and 1000 grain weight. These results also suggest that the comparatively lower temperature at anthesis, and grain filling stages of the second and the ratoon crop has a favourable effect in increasing the yield potential of the crop. Successful ratooning of rice has recently been reported by Bahar & De Detta (1977). From the present studies, it can be inferred that double cropping is feasible for increasing rice production in Pakistan particularly with the rice cultivar Kashmir Basmati due to its high rotooning ability. It has also been found that it is more economical to grow ratoon crop because of the less labour and water requirements. Effect of double cropping on the grain quality is yet to be determined.

Table 2. Climatic data recorded at Faisalabad from April to November during 1975-1977.

Month / Element	Temperature (°C)						Mean Relative Humidity %						Mean Monthly rainfall (mm)		
	Maximum			Minimum			8.00 A. M.			5.00 P. M.					
	1975	1976	1977	1975	1976	1977	1975	1976	1977	1975	1976	1977	1975	1976	1977
April	32.8	31.6	31.9	16.9	16.8	18.4	56.1	58.9	76.9	34.9	36.4	38.5	15.5	22.9	32.4
May	39.1	38.0	35.2	23.6	23.1	21.5	40.9	16.7	60.4	25.3	24.4	43.5	Nil	24.9	44.2
June	39.3	37.7	37.7	25.4	24.4	25.3	52.7	57.8	60.5	32.7	38.6	47.3	22.9	67.1	35.3
July	35.6	36.1	34.9	25.0	27.2	27.0	73.8	69.4	80.2	54.7	58.8	61.8	128.7	117.4	86.1
August	32.7	31.8	36.1	27.2	24.7	26.8	75.9	79.7	73.4	62.9	70.9	60.4	271.0	193.0	21.0
September	34.1	33.1	33.7	23.9	23.3	23.9	77.9	78.3	74.0	62.3	59.1	57.2	7.6	20.3	74.4
October	34.3	31.8	32.5	17.2	18.3	19.2	62.2	67.0	64.6	40.4	45.6	49.5	Nil	10.1	Traces
November	26.6	26.1	27.8	7.6	8.7	12.2	75.7	66.6	70.5	45.1	47.3	52.9	Nil	–	2.1

Courtesy: Plant Physiology Section, Punjab Agricultural Research Institute, Faisalabad.

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