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STUDY ON EFFECT OF DATE OF SOWING AND STAGE OF HARVEST ON SPLIT HUSK OCCURRENCE AND SEED QUALITY IN RICE HYBRID ADTRH1

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Abstract

Rice is the staple food for the most of the people in tropics and sub-tropics countries in the world. Experiment was conducted to study the effect of date of sowing and stage of harvest on split husk occurrence and seed quality in rice hybrid ADTRH1. Experiment on stage of harvest revealed that split husk percent was minimum when seed was harvested 25 days after 50% flowering. Split husk occurrence increased at later stages of harvesting. There was a light increase in split husk percent after drying of the seeds as compared to the value before drying. Seed quality as revealed by 100 seed weight, germination percent, root length, shoot length and vigor index was maximum on the seed harvested 30 days after 50% flowering. Between dates of sowing, December sown crop registered more seed set, seed germination and vigor index than January sown crop. The above study revealed that crop should be sown on December month and harvested at 30 days after 50% flowering to get lower split husk percent and high quality seed in rice hybrid ADTRH1.

Key words: rice hybrid, stage of harvest, date of sowing, ADTRH1, split husk, seed quality.

Introduction

Rice is the staple food crop in India and in developing countries of the world. Rice covers more than 11 percent of earth's centre aerable area, of these India with 44.6 m.ha. India stands first in area, second in production (87.6 m.t) but 35th in productivity. During the past two decades, remarkable achievements have been made in the rice production and productivity. In Tamilnadu, rice is grown in an area of 2.2 m.ha with annual production of 5.6 million tonnes. The average productivity in Tamilnadu is 2.54t/ha, while in India is 2.759t/ha. To achieve the target of 140 m.t. on 2025 A.D, the productivity should be increased to 3.9t/ha.

With almost no scope for expansion of area under rice production, a varietal yield improvement per unit area is the only way for achieving the targeted production. To keep up the growing population, the country needs an additional 2.5 million tomes every year. A break through in this morass situation is possible only by the evolution of another kind of rice production by way of increasing biological efficiency of rice varieties. Ultimately, it was obvious that the growing demand for food grains can be met only through hybrids.

Seed production has twin objectives of high yield and reasonable quality standards. The development of seed production technologies include fixing up of proper stage of harvest which will decide the seed yield and its quality. In order to realize the highest seed yield, seed crop should be sown at proper time and also harvested at proper time and if delayed, yield loss will occur and quality will be affected. The present experiment was conducted to study the effect of stage of harvest and date of sowing on seed yield and seed quality.

Materials and Methods

The present investigation was carried out with the view to study the effect of stage of harvest and date of sowing on Split husk occurrence and seed quality parameters in rice hybrid ADTRH1. The experiment was planned in a seed production plot of rice hybrid ADTRH1 raised during December 15(D_1) and January 15(D_2). Five female plants with hybrid seeds were harvested on 25th (S_1), 30th (S_2) and 35th (S_3) days after 50% flowering in the plot from four replication. FCRD design was adopted in the experimental plot. The seed quality parameters like split husk percent, seed set percent, germination

percent, root length, shoot length, dry matter production, vigor index, electrical conductivity and hundred seed weight. The data were analyzed by the F-test for significance following the methods described by Gomez and Gomez, (1984). Wherever necessary, the percentage values were transformed to corresponding arcsine values, before carrying out the statistical analysis. The transformed values were given in parentheses. The critical difference (C.D) was worked at 5 percent (P = 0.05) level. Wherever F value was non-significant, it was denoted by the letters "NS".

Results and Discussion

Developing rice seed has direct exposure to the external environment. Normally the seeds are to be harvested at harvestable maturity stage when the seed quality would be expected to be at peak. Such results have been reported in Pea (Mathews, 1973; Bedford and Mathews, 1976), in Sorghum (Krishnasamy and Ramaswamy, 1985) and in Groundnut (Sombatsiri and Nuan, 1987). Harvesting of seeds either earlier or later than the harvestable maturity stage may have reflection on incidence of split husk in hybrid rice seeds.

The present study clearly revealed that the delay in the stage of harvest beyond 25 days significantly increased the incidence of split husk seeds. Dates of sowing and stages of harvest exerted significant influence for split husk percent. Seeds of D_1 (30.53 percent) showed lesser split husk occurrence compared to D_2 (31.92 percent). Among different stages of harvest, S_1(28.90 percent) recorded minimum split husk percent and S_3(34.14 percent), the maximum (Table 1). Increase in split husk occurrence might be due to the development of caryopsis even beyond 25 days without a corresponding development in husk. This inference draws further support from the hundred seed weight showed increased improvement at 30 days and 35 days after 50% flowering compared to 25 days after 50% flowering. A Marginal increase in the percentage of split husk seeds was recorded after drying of seeds as compared to before drying probably because drying process could have caused shrinkage of husk. Significant difference was observed for seed set percent due to date of sowing and stage of harvest. Between dates of sowing, D_1(28.53 percent) recorded more seed set than D_2(11.95 percent). Among different stages of harvest, maximum seed set was recorded by S_3(21.82 percent) and Minimum was recorded by S_1(17.58 percent) according to table 2.

Significant difference was noticed for germination percent due to stage of harvest and date of sowing. D_1(83 percent) recorded higher germination percent than D_2(75 percent). S_2(84 percent) recorded the highest germination percent and S_3(74 percent), the lowest (Table 2). Date of sowing and stage of harvest exhibited significant influence on shoot length and root length.

Table 1: Effect of date of sowing and stage of harvest on split husk percent in Rice hybrid ADTRH1.

Date of sowing	Split husk seed before Drying				Split husk seed after Drying			
	Stage of Harvest				Stage of Harvest			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean
D_1	27.80	29.75	34.03	30.53	28.83	30.78	34.95	31.52
D_2	30.00	31.50	34.25	31.92	31.00	31.50	34.50	32.33
Mean	28.90	30.63	34.14		29.91	31.14	34.73	
	D	S	DS		D	S	DS	
SEd	0.5962	0.7301	NS		NS	0.5836	NS	
CD (P=0.05)	1.2707	1.5563	NS		NS	1.2440	NS	

Table 2: Effect of date of sowing and stage of harvest on Seed set percent and Seed Germination percent in Rice hybrid ADTRH1 (Figures in parenthesis indicate arc-sin transformation).

Date of sowing	Seed set percent				Seed Germination percent			
	Stage of Harvest				Stage of Harvest			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean
D_1	26.25	29.80	29.53	28.53	78 (62.14)	88 (69.98)	84 (66.42)	83 (65.82)
D_2	8.92	12.83	14.12	11.95	69 (56.22)	80 (63.46)	76 (60.69)	75 (60.30)
	D	S	DS		D	S	DS	
SEd	1.2704	1.5559	NS		1.6667	2.0412	NS	
CD (P=0.05)	2.7078	3.3163	NS		3.5525	4.3508	NS	

Table 3: Effect of date of sowing and stage of harvest on Shoot length (cm) and Root length(cm) in Rice hybrid ADTRH1.

Date of sowing	Root Length (cm)				Shoot Length (cm)			
	Stage of Harvest				Stage of Harvest			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean
D_1	18.4	22.3	22.1	20.9	12.4	13.4	12.8	12.9
D_2	19.4	21.3	20.1	20.3	11.7	12.4	11.4	11.8
Mean	18.9	21.8	21.1		12.1	12.9	12.1	
	D	S	DS		D	S	DS	
SEd	0.00504	0.0061	0.0086		0.0043	0.0053	0.0075	
CD (P=0.05)	0.0105	0.0128	0.0181		0.0090	0.0111	0.0157	

Table 4: Effect of date of sowing and stage of harvest on dry matter production (mg seedlings^{-1}) and Vigor index in Rice hybrid ADTRH1.

Date of sowing	Dry matter production (mg seddings^{-1})				Vigor index			
	Stage of Harvest				Stage of Harvest			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean
D_1	115	119	122	119	2086	2972	2868	2642
D_2	109	116	117	114	2138	2702	2459	2430
Mean	112	118	120		2112	2837	2663	
	D	S	DS		D	S	DS	
SEd	3.3330	4.0830	NS		97.79	119.77	NS	
CD (P=0.05)	7.0030	8.5770	NS		208.45	255.29	NS	

Table 5: Effect of date of sowing and stage of harvest on 100 seed weight and electrical conductivity (dsm^{-1}) of seed leachate in Rice hybrid ADTRH1.

Date of sowing	100 Seed weight (g)				Electrical conductivity (dsm^{-1})			
	Stage of Harvest				Stage of Harvest			
	S_1	S_2	S_3	Mean	S_1	S_2	S_3	Mean
D_1	2.030	2.042	2.041	2.038	0.1835	0.1303	0.0872	0.1337
D_2	2.025	2.041	2.040	2.035	0.2005	0.1518	0.1000	0.1508
Mean	2.028	2.042	2.041		0.1920	0.1410	0.0936	
	D	S	DS		D	S	DS	
SEd	NS	0.002	NS		0.0051	0.0062	NS	
CD (P=0.05)	NS	0.0052	NS		0.0108	0.0032	NS	

D_1(20.9 cm) recorded lengthier root than D_2(20.3 cm). S_2(21.8 cm) recorded the longest root and S_3(21.1 cm), the lowest value (Table 3). Date of sowing and stage of harvest exhibited significant influence for dry matter production but the interaction effect was not significant (Table 4).

Dry matter production was more in D_1(119 mg) than in D_2(114 mg). Dry matter production was maximum in S_3(120 mg) and minimum in S_1(112 mg). Similar effect was exhibited for vigor index.

Seed vigour is more sensitive to harvesting time and could be better used to predict the optimum seed harvesting time (Hong Fu *et al*., 2017). Xiaomin Wang *et al*., 2018 revealed that hybrid rice seed can be earlier harvested based on seed vigour. Vigor index was significantly more in D_1(2642) than in D_2(2433). S_2(2837) recorded maximum vigor index (Table 4). These findings are on par with report of Buriro *et al*., (2015), that delay of sowing had negative effects on the performance of quantity and quality of maize.

Though harvesting at 25 days after 50% flowering was advantageous in terms of split husk, seed quality parameters like germination, root length, shoot length of seedling and vigor index were at peak when the seeds were harvested at 30 days after 50% flowering in both dates of sowing. Probably 30 days after flowering was the harvestable maturity stage in rice hybrid ADTRH1. Seetanum and Datta, (1973) suggested optimum time for harvesting IR20 rice as 30 to 32 days after heading in dry season. According to Bac and Ojha, (1975), the maximum grain yield was obtained by harvesting 28 to 36 days after flowering. According to Dutta, (1979), the harvestable maturity stage of rice cultivar *Amarvathi* and *Vaigai* was attained 28 days after 50 percent flowering and in *Bhavani*, 31 days after 50 percent flowering stage.

Conclusion

Experiment on stage of harvesting revealed that split husk percent was minimum when the seed was harvested 25 days after 50 percent flowering. Split husk occurrence increased at later stages of harvesting. There was a light increase in split husk percent after drying of the seeds as compared to the value before drying. Seed quality as revealed by 100 seed weight, germination, root length, shoot length and vogor index was maximum in the seeds harvested 30 days after 50% flowering. Between dates of sowing, December sown crop registered more seed set, seed germination and Vigor index than January sown crop. Thus from the above study, it was revealed that crop should be sown on December month and harvested at 30 days after 50% flowering to get lower split husk percent and high quality seed in rice hybrid ADTRH1.

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