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EFFECT OF WEATHER ON RICE UNDER DIFFERENT SOWING DATES

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Abstract: *Rice is a weather sensitive crop and its production is adversely affected by slight change in the weather parameters. An experiment was carried out to study the relation between rice and the weather with five dates of planting from June 1st to August 1stat fortnightly intervals in 2016 and 2017 in Randomised Block Design with the variety Prathyasa. Crop duration was severely affected with weather factors. Correlation analysis showed that minimum temperature negatively influenced the crop duration while relative humidity and rainfall had positive effects. Rainfall in the initial stages favored higher yield in early sown crop and with delay in planting crop duration decreased and it reduced the grain yield.*

Keywords: *Weather, rice, sowing dates.*

Introduction

Rice is the major staple food for more than half of the worlds' population (FAO, 2013) accounting for approximately 30% of the total dietary intake, globally and in South Asia (Lobell *et al.*, 2008).Rice production in the tropics is sensitive to climatic factors (temperature, rainfall, and solar radiation) which affect the crop in various ways during different stages of its growth (Yoshida, 1978).India being a major rice consumer and producer in South Asia, continues to grapple with stark issues of hunger, malnutrition, poverty and food insecurity, despite the success of green revolution resulting in significant improvements in the productivity of food crops, including rice (Kumar*et al.*, 2013). Thus, any adversity to the rice production system in the Indian sub-continent has significant consequences. An experiment was conducted to find the effect of weather on rice crop by taking treatments as different dates of sowing in *viripp*useason of 2016 and 2017.

Materials and Methods

The field experiments were conducted at Ookode farmers' field near to College of Agriculture, Vellayani during*Kharif*seasons of 2016 and 2017.The treatments of the investigation were five dates of planting from June 1st to August 1stat fortnightly intervals and it was laid out in Randomised Block Design.The variety selected was Prathyasa and it was a direct seeded crop. There were 15 plots in the field, each treatment with three replications with individual plot size of 4 x 5 m^2. To study the response of the rice crop with weather parameters, weather data were also recorded on a daily basis. Correlation analysis was done between various weather parameters and yield and phenology of the crop by using two years data. The phenophases taken wereAT – Sowing to Active Tillering stage, PI – Active Tillering to Panicle initiation, B – Panicle initiation to Booting, H – Booting to heading, F – Heading to 50 % flowering and PM- 50% flowering to physiological maturity.

Results and Discussion

Crop phenology and weather

The days for attaining the different phenological stages varied with the date of planting in both the years. The days taken by different phenophases were influenced by the weather parameters.With delay in planting the crop underwent physiological maturity in much lesser days than the early planted ones. The days from sowing to physiological maturity ranged from 90 to 105 days in 2016 and 99 to 110 days in 2017.Table 1 represents

the number of days taken by the crop to attain different phenophases from active tillering to physiologicalmaturity by *var.* Prathyasa for five dates of planting in 2016 and 2017.

Table 1: Days taken by rice *var.* Prathyasa during each phenophase of crop growth at different dates of planting

Phenophases	June 1st		June 15th		July 1st		July 15th		August 1st		MEAN
	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2	
AT	36	35	35	34	34	34	31	31	30	31	33.1
PI	51	54	48	50	47	50	47	50	41	47	48.5
B	59	62	56	58	55	58	55	59	54	58	57.4
H	67	69	67	67	66	68	66	69	65.5	69	67.35
F	76	78	74	75	75	77	74	76	72	75	75.2
PM	105	110	99	105.5	92	105	92	100	90	99	99.75

Table 2: Correlation between weather parameters and crop phenophases of Prathyasa

Crop stages	Tmax	Tmin	RH1	RH11	BSS	Rain	RD
AT	-0.020	-0.838**	0.690*	0.819**	-0.076	0.804**	0.724*
PI	-0.368	0.128	0.003	0.178	0.833**	0.186	0.618
B	0.009	0.128	0.062	0.435	-0.104	0.383	0.22
H	-0.357	0.073	0.478	0.525	-0.560	0.706**	0.732*
F	0.010	0.234	0.200	0.267	0.070	0.425	0.442
PM	-0.130	0.304	0.429	0.310	0.671*	0.766**	0.712*

From Table 2, it can be understood that with the increase in minimum temperature, the duration from sowing to active tillering decreased while the relative humidity increase during this stageresulted in the increased duration.The amount of rainfall and rainy days also showed the same effect as that of relative humidity. The results showed that with increase in minimum temperature during AT decrease the duration of the crop (Fig.1). This is the reason why late sown crops which received the high minimum temperature took less duration compared with other early sown crop, which results in less yield in late sown.

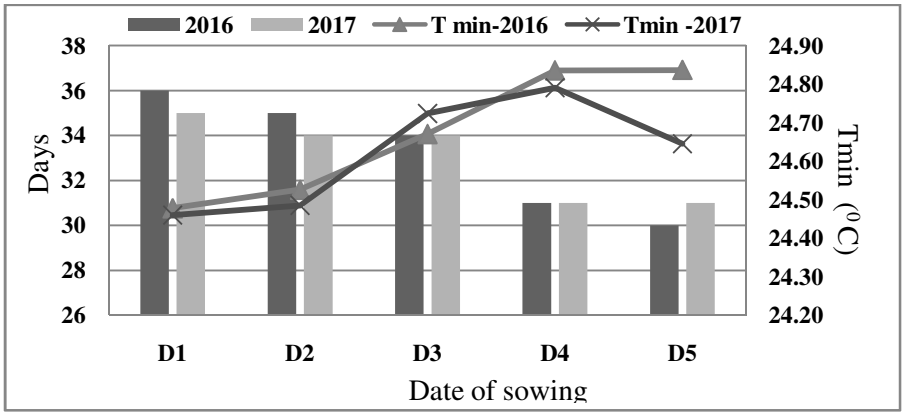

Fig.1. Influence of minimum temperature on days taken for active tillering

The increased BSS and rainfall during the physiological maturity stage also increased the duration in early sown crops (Fig.2 and Fig.3)

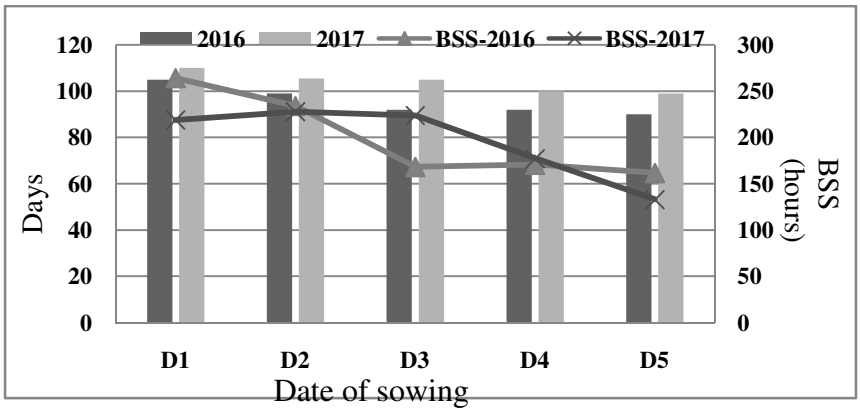

Fig.2. Influence of BSS on days taken for physiological maturity

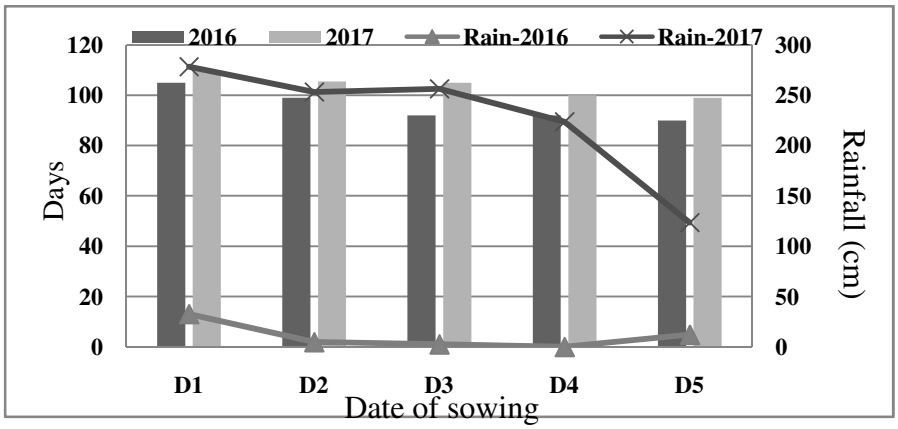

Fig.3. Influence of rainfall on days taken for physiological maturity

Grain yield and date of planting

The grain yield and its attributes for the variety Prathyasa were worked out for both the years and are given in Table 3. In 2016, the highest grain yield was obtained from June 15 (D2) sown crop andin 2017 it was June 1st (D1) sown crop.In both years late sowing resulted in reduced yield. Comparatively lower yield were obtained fromAugust 1st(D5) sown crop in 2016 and July 15th(D4) sown crop in 2017.Though there was a definite trend in reduction in yield with delayed dates of sowing the reduction was lower in August1st(D5) sown compared to July 1st(D3) and July 15th(D4) sown crops in both the years.

Table 3: Yield and yield attributes of rice var. Prathyasa in 2016 and 2017

Date of sowing	Yield		Spikelets per panicle		Filled grains per panicle		1000 grain weight	
	Y1	Y2	Y1	Y2	Y1	Y2	Y1	Y2
D1	6114.94	5328.18	101.56	96.67	87.67	83.00	28.13	31.27
D2	6443.28	4696.44	98.83	93.67	83.58	81.00	25.80	29.73
D3	4798.97	3092.78	82.67	80.33	65.84	63.67	28.53	29.80
D4	3752.36	2691.87	80.09	78.00	65.88	61.00	29.03	29.80
D5	3751.43	3532.61	90.55	88.00	77.66	73.33	28.13	30.47
CD (0.05)	373.192	270.064	2.668	7.580	2.936	5.578	NS	NS

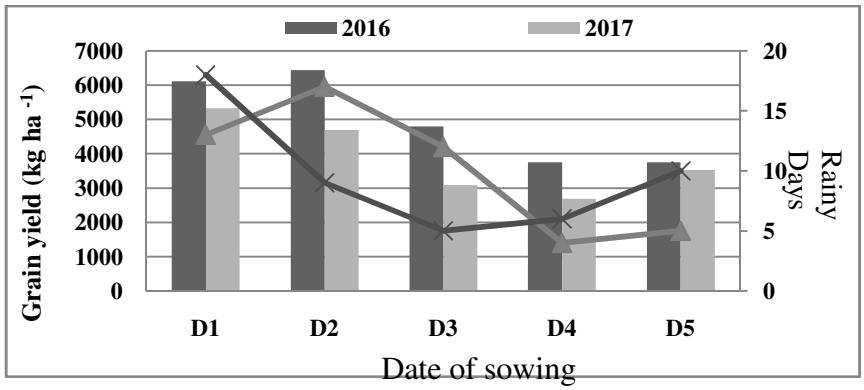

Fig.4. Influence of rainy days on grain yield of *var*. Prathyasa

The correlation analysis of grain yield with weather parameters are given in Table 4. The effect of rainfall and rainy days on sowing to active tillering stage is the reason for higher grain yield in June 1st and June 15th sown crops (early sown crops) in both the years. As far as the yield trend is concerned, in 2016 June 15th sown crop (D2) is followed by June 1st sown crop (D1) followed by further dates of sowing but in 2017 highest grain yield is obtained from D1 followed by D2, D3,D5 and D4 (Table 3). This is due to the occurrence of uniformly distributed rainfall during 2016, it favored higher yield in D2 than in D1 (Fig.4).The effect of RH also contributed to the production of higher grain yield in early sown crops. The rainfall and rainy days during panicle initiation, booting, heading, 50 % flowering and physiological maturity affected the grain yield negatively in late sown crops whereas maximum temperature and minimum temperature effect on panicle initiation, booting, heading and 50% flowering resulted in increased grain yield in early sown crops. At flowering to physiological maturity stage, maximum temperature and BSS had a positive influence on grain yield in early sown crops whereas relative humidity, rain and minimum temperature decreased the yield in late sown crops.

Table 4: Correlation of yield with weather parameters at different phenophases

Crop phenophases	T max	Tmin	RH 1	RH11	BSS	RAIN	RD
Sowing- AT	-0.0322	**-0.7751	**0.89798	**0.85358	-0.0922	**0.79864	**0.829
AT-PI	0.04032	0.26608	0.11892	0.31205	-0.0055	-0.1699	-0.218
PI- Booting	0.08616	**0.58608	-0.1378	-0.0927	0.17858	**-0.5327	-0.329
Booting- Heading	0.21775	**0.61171	-0.2852	0.08696	-0.0241	**-0.5141	*-0.423
Heading - 50% flowering	0.18565	0.33506	**-0.5329	*-0.4168	0.25738	**-0.5163	*-0.469
50% Flowering- Physiologic maturity	**0.51405	-0.3491	*-0.3631	**-0.5009	**0.64007	-0.3262	*-0.445

Conclusion

Weather parameters show variation from year to year and it has considerable influence on the yield and maturity stages of the crop. The variations in the phenophases of the rice crop provide proof to the relationship of crop growth and development with weather. The amount of rainfall and more number of rainy days received during the initial stages of the crop in 2016 might have resulted in the higher yield in 2016 than in 2017. Also delayed planting required only lesser days to attain maturity compared to the early planted crops but it has a negative impact on yield.

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