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Continuous Cropping-Effect of Planting Months and Fertiliser on Yield and Yield Components of Rice.

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With the object of finding out the influence of temperature and fertiliser usage for different times of planting a field experiment was carried out with IR.8 rice for 24 months covering two calender years 1971-72, 1972-73 with four levels, of fertilisers viz., 148:70.70. 185:87;87; 222:104:104 and 259:121:121 Kg NPK/ha. The results revealed that mean temperature prevailed during flowering to maturity had significant influence on grain yield and the positive correlation 'r' being 0.859. Planting in February was superior to other planting months followed by January, March and July. Fertiliser levels had no influence on grain yield and the lowest level viz 148.70:70 NPK/ha is suitable under continuous cropping condition i.e. in rice-rice-rice rotation. Of the yield components, filled spkiclets and 1000 grain weight had influence on grain yield. Whereas panicle number had no influence.

Rice is a popular crop in wet lands of Tamil Nadu and rice after rice is a common cropping pattern. After the advent of high yielding photo insensitive rice varieties like IR.8, rice is being grown throughout the year under assured water supply condition. It has been observed in farmer's fields that with same inputs of fertilizer and with the same variety of rice the yield variation existed. Reasons for variation in yield of rice has to be investigated so that it will be possible to pin point the best time of planting and to know the causes for low yield and for developing possible ameliorative measures. The manurial recommendations for high yielding varieties have been found to vary depending on planting months. Investigation on optimum dose of fertilisers for the planted crop in different months will be useful for the farmers to regulate the right time of planting and optimum dose of fertilisers for obtaining maximum yields and returns.

MATERIAL AND METHODS

Field experiment was carried out in wet land farm of Tamil Nadu Agricultural University during the year 1971-73. The soil is black clay loam with pH 73 and EC 0 5.m mhos/cm². The design of the experiment was in split plot with four planting months as main plots repeated 3 times. sucessively in a year and fertiliser level as sub plots replicated five times. Thus main plots consisted of the plantings in all 12 months of a first year (February 71 to March1972)and was repeated forsecond year(April 1972. to March 1972) The four fertiliser levels in sub plots were 148:70:70, 185:87:87, 222:104:104 and 259:121:121 kg N:P:K per hectare. Rice seedlings were raised in nursery periodically and 25 days old seedlings were planted each month. Application of fertiliser as urea was made in two splits 2/3 of the total quantity of N and entire quantities of P and K were applied as basal. The remaining 1/3 of

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N was applied as top dressing at the time of panicle initiation. The maximum and minimum temperature and the mean temperature (average of maximum and minimum temperature) at different stages of crop growth viz planting, tillering, panicle initiation flowering and ripening were recorded seven days preceding the respective stage (Swamson 1951). The data on growth, yield components and grain yield of 24 months were analysed statistically and are presented and discussed. (Table).

RESULTS AND DISCUSSION

Yield Components:

(i) Panicle number: It is seen from table that the panicle numbers per square meter are influenced by planting months. Fertilizer levels had no influence on the production of panicles in both the years and there was no interaction between month of planting and fertiliser levels.

(ii) *Number of filled spikelets*

Number of filled spikelets per sq. m. was signficantly influenced by planting months in both the years Higher number of filled spikelets was seen in February and July planting and it was the lowest in October in the first year. In the second year maximum filled spikelets was recorded in February, January, March and April plantings with lowest in October. Thus in two years there was similarity in the filled spikelets contents of crop in planting months indicating seasonal influence on grain setting. When favourable warm conditions existed at flowering period there was good grain setting. The cool temperature at flowering period interfered with grain setting as the gynocium is more sensitive than other flower parts and caused sterility as in the case of October plantings in both the years. Similar observations (spikelet sterility caused by cold temperature) have been reported by Daubenmire (1947). Natsushima (1966), Munakata (1968), Satake (1969), Ishizaka (1971), Lin and Peterson (1975).

Significant positive correlation between maximum temperature at panicle initiation to filled spikelets was found (r = 0.644). The Spikelet number per sq. meter was also correlated to grain yield in both the years (0.415** and 0.422** for the I and II year respectively).

Fertiliser levels had no influence on the number of filled spikelets of the panicle in any of the planting months and there was no interaction between fertiliser levels and planting month influencing the number of filled spikelets.

(iii) *Thousand grain weight*

Significant differences in thousand grain weight per planting month have been obtained. In the first year higher thousand grain weight was obtained in September planted crop in the second year higher thousand grain weight was recorded in February April, May, July and June, while lesser weight was recorded in October and January planted crops indicating that there was better filling of grain due to favourable mean temperature prevailing at the time of ripening period.

Fertiliser levels had reduction in thousand grain significantly with higher level of fertiliser in the first year. In the second year, it was not significant for fertiliser levels. There was no Interaction present between planting month and fertiliser levels in influencing thousand grain weight.

Grain yield

The grain yield data presented in table 1 reveal that in both the years the yield differences were significant for planting months. In the first year highest grain yield was obtained from the crop planted in December, which was on par with planting months of February, March and January. In the second year February planting was superior to other plantings in grain yield. The combined analysis of grain yield data of both the years revealed that February planting was significantly higher than other planting months, while October planting recorded the lowest yield. February planting also recorded the highest per day production of 48.5 kg/ha followed by March and January plantings with 44.9 kg and 38.1 kg/ha respectively. Thus it could be concluded that grain yield of rice was mainly influenced by month of planting.

Among the seasons, the grain yield in Navarai (Summer) is significantly superior to other seasons follwed by Kuruvai, Samba or Thaladi (vide Table 2). Mean temperature at ripening in different seasons of planting differentiates the yield in Kuruvai, Thaladi and Navarai. This is also in agreement with the observations of Krishnan and Soundararajan (1965).

The effect of temperature at different stages of crop especially at tillering, panicle initiation and flowering to maturity on grain yield was studied in a multiple correlation. It is seen that among the stages of crop growth, the influence of temperature at flowering to maturity was more pronounced. The grain yield was, influenced by the mean temperature (average of maximum and minimum temperatures) prevailing at the time of ripening and the 'r' value being 0.859**. A regression equation was fitted) wherein yield in kg/ha (r) was correlated with variables of mean temperatures at panicle initiation (X1), flowering (X2) and flowering to maturity period X3).

$$\hat{Y} = -11629.61 + 43.12\ X1\ NS + 26.29\ X2\ NS + 842.55\ X3^{**}$$

Where $\hat{Y}$ = grain yield

(N.S. = Not significant; ** = significant at 1% level)

Thus the study reveals that grain yield of rice is mainly influenced by air temperature prevailing at the time of flowering to maturity i e. ripening period and knowing the existing air temperature conditions in a situation we can correctly fix the best time of planting of rice to the farmers for getting good grain yield, when the irrigation water is not a limiting factor

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Table 1 yield and yield components as affected by planting months

Planting Months	MEAN							
	Penicle No. per sq.m.		No.of filled spikelets		1000 grain weight in gm		Grain yield (kg/ha)	
	I Year	II Year	I Year	II Year	I Year	II Year	I Year	II Year
March	460	427	72.4	90.0	28.4	27.4	5241	4363
April	381	445	64.8	80 9	26.6	28 6	4830	4829
May	446	423	45.7	73.3	27.4	28 6	4324	4332
June	556	473	66 7	50.6	28.0	28.1	4025	4224
July	526	423	96.7	63.4	26.8	28.5	4471	4251
August	485	509	80.1	41 9	26.8	27.3	4950	3478
September	405	547	32.4	57.8	29.5	28.0	3315	3872
October	467	547	34.0	46.3	28.8	25.5	1135	2275
November	419	389	70.0	50 7	26 7	27.4	4746	3193
December	656	386	78.0	80.5	29.5	28.0	5356	3856
January	408	485	64.0	95.0	26 7	27.0	5158	4602
February	392	405	91.0	95.2	28.3	29 4	5290	5916
Mean								
S.E.	54.5	51 5	8.3	8.3	0.37	0.77	207	243
C.D.	120.0	114.0	18 3	18.2	0.81	1.69	466	533

TABLE-2 Grain yield (kg/ha) as influenced by mean temperature at ripening of planting season

Year	Season*	Mean temp. at ripening	Grain yield for series (kg/ha)	Grain yield for years (kg/ha)
I	Kuruvai	26 6	4607	
	Thaladi	25.5	3473	4414
	Navarai	26 6	5138	
II	Kuruvai	26 6	4411	
	Thaladi	24 6	3194	4079
	Navarai	27.7	4684	
		CD for Season		237
		CD for Years		137

* Kuruvai : March to July plantings
Thaladi : July to November plantings
Navarai : Nov. to Merch plantings