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EFFECT OF STAGGERED PLANTING AND DIFFERENT FERTILIZER DOSE ON INCIDENCE OF BLAST DISEASE AND GRAIN YIELD OF PADDY UNDER CAUVERY COMMAND AREA OF MANDYA DISTRICT OF KARNATAKA, INDIA

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ABSTRACT

A field experiment was conducted during 2023-24 and 2024-25 at Krishi Vigyana Kendra, V C farm, Mandya to evaluate the effect of staggered planting and improper fertilizer doses on Blast incidence of paddy under Cauvery command area. The popular paddy variety of Mandya district MTU-1001 was planted from July 15th to October 1st at 15 days interval, six planting time with four fertilizer doses were applied to the paddy crop. No fungicides were treated to manage the disease. The results revealed that the incidence of leaf blast was 30.60 per cent and neck blast was 36.75 per cent in October transplanted crop with an increased nitrogen dose application. The least disease was recorded in fertilizer dose 4 with mid planting (5.24 per cent). Irrespective of fertilizer dose early planting was recorded lowest leaf blast and neck blast incidence.

Keyword : Blast, Staggered, Fertilizer dose, Paddy.

Introduction

Indian agriculture is said to be gamble with monsoon which are uncertain, irregular and unequally distributed. Nearly 55% of the net sown area continues to depend on rainfall rather than irrigation, time since pre independence era but the scenario changes post-independence era, presenting a curious paradox- green revolution during 1960,s in India (Senapathi and Goyari, 2018). However, construction of KRS dam aided the farmers of Mandya to walk on the path of glorious progress. Cauvery command area is known for paddy cultivation throughout the year. Most of the farmers in the district are cultivating paddy crop either in one or two seasons which depend on availability or release of water from canal. In Mandya district, paddy occupies an area of 65,522 ha with a production of 1,84,307 MT and productivity of 3400 kg ha⁻¹.

Among the crop production practices, optimum time and method of sowing are the two important agronomic tools that allow the crop to complete its growth timely and successfully under specific agro-ecological conditions. Recently weather variability is

considered one of the major factors of inter-annual variability of crop growth and yield in all environments besides rainfall, temperature and bright sun shine hours also have been bearing on crop growth and development as well as yield response of different species to different environments, can be quite different. Shift in sowing dates directly influences both thermo and photo period, and consequently have great impact on the phasic development and partitioning of dry matter.

Nitrogen fertilization plays an important role in the severity and incidence of rice blast. Nitrogen (N) is most important nutrient for photosynthesis and biomass production, whereas phosphorus (P) is essential for root growth, flowering, ripening and also resistance towards disease and drought. Potassium (K) affects crop metabolism, growth, grain filling, and viability of pollen grains (Datta *et al.*, 1985). Although all seventeen essential plant nutrients are important in achieving genetic potential yield of any crop or variety. The imbalanced macronutrients supply is known to ominously affect productivity of paddy (Jiban *et al.*, 2020).

The present climatic shift due to global warming has resulted in the early and delayed onset of monsoon affecting the farmer's planting activity with respect to paddy crop in Mandya district. Similarly uneven distribution pattern of rainfall, and unavailability of water source in canal is forcing farmers to take up planting activity during different dates which has profound influence on incidence of biotic stress. A preliminary survey conducted at different taluks of Mandya district revealed that farmers were using above optimal dose of Nitrogen and Phosphorus and below the dose of potash fertilizer which were leading to the severe biotic stress in delayed planting areas.

The present investigation aims to evaluate the effect of staggered planting and different fertilizer dose on blast disease and yield performance of paddy in Mandya district.

Methodology

The field experiment was carried out in farm of Krishi Vigyana Kendra, Vishweshwaraiah Canal, Farm, Mandya district of Karnataka state for the year 2024 and 2025 Kharif season. The popular variety MTU-1001 were used in the experiment using random block design. The variety was transplanted from July 2nd week to October 1st week at 15 days interval, 6 staggered planting were done. The varieties were sown on specific dates and transplanted 25 days after sowing, keeping 15×20 cm row to row and plant-to-plant spacing. Irrigation and weeding were carried out when necessary and four different fertilizer dose like 40:20:20 (Optimum dose), 60:25:10, 65:15:15 and 50:47:30 were applied. The leaf blast and neck blast was scored by the standard scale given by IRRI, 2002.

Score	Score Per cent leaf area covered
0	No lesion
1	Small brown specks of pinhead size
2	Larger brown specks
3	Small, roundish to slightly elongated, necrotic grey spots, about 1-2mm in diameter, with brown margin
4	Typical blast lesions elliptical, 1-2 cm long, usually confined to the area of the 2 main veins infecting less than 2% of the leaf area.
5	Typical blast lesion infecting less than 10% of the leaf area
6	Typical blast lesion infecting 11 – 25% of the leaf area
7	Typical blast lesion infecting 26 – 50% of the leaf area
8	Typical blast lesion infecting 51 – 75% of the leaf area and many leaves dead
9	All leaves dead

Per cent disease index (PDI) will be calculated by using the below mentioned formula given by Wheeler 1969.

$PDI = (\text{Sum of all the disease ratings} / \text{Total number of leaves examined}) \times (100 / \text{Max. Disease grade})$

The data collected from the experimental field were analyzed statistically following the procedure as described by Gomez and Gomez (1984).

Result and Discussion

The effect of staggered sowing and different fertilizer dose on blast incidence was presented in table 1. The fertilizer dose 3 in which nitrogen applied in high dose, phosphorus and potash applied in reduced dose along with October transplanted crop recorded highest leaf blast incidence of 30.66 per cent and 36.75 per cent neck blast incidence. In optimum dose of fertilizer early planting recorded no incidence of leaf and neck blast incidence. The fertilizer dose four in which phosphorus and potash was applied more than nitrogen dose recorded less leaf blast (19.40) and neck blast (24.69) incidence in delayed planting also. Irrespective of fertilizer dose early July planting recorded no leaf and neck blast incidence compared to delayed planting in all the doses of fertilizer applied. Moreover, fertilizer N-P-K would allow the plants to

resist to the biotic stresses such as the fungi diseases. Indeed, the nutritional factors change the chemical composition of the cell by reinforcing their pectocellulosic membranes to prevent the penetration of pathogenic (Anderson, 2002). Thus, resistance to the fungi diseases depends on the thickness of the cuticle, and skin, the incorporation of silica on the leaf area, thickness, pectocellulosic membrane and opening of the stomata. Potassium intervenes in the balance acid basic of the cells and regularizes the intracellular exchanges, it contributes to reinforce the cellular wall; thus offering to the plants a better resistance to the diseases or to parasites (Doderman, 2000). More there is nitrogen in the medium more the vegetative growth is significant. An increase in the concentration of the amino acids in the apoplast and on the surface of the leaves which induces the germination of the conidia was observed. A great quantity of nitrogen changes the metabolism of the plant by reducing the activity of enzymes responsible for the biosynthesis of phenol and lignin which reduces phenol and lignin in the cell

whereas they are involve in the defense system of the vegetable cell against the infections (Djomo sime *et al.*, 2017). Imrani *et al.* (2014) reported that potassium is a major factor in the reduction of the foliar diseases of rice. Indeed, in the case of a lack of potassium the exudates of the plant can contain some components (amino sugar and acids) which would cause the establishment of great fungi infections. The balance between nitrogen and potassium affect the susceptibility of the plant to the diseases. The application of potassium lowers the severity of the fungi diseases and increases the output (Sharma *et al.*, 2005). Potassium also plays a significant role in the development of cuticle which constitutes a significant physiological barrier against infections.

The effect of fertilizer dose and staggered planting on growth and yield parameter was presented in table 2. The result showed that irrespective of fertilizer dose the early planting recorded more number of tillers compared to late planting. 4th fertilizer dose in which nitrogen, phosphorus and potash was more compared to optimum dose which recorded highest number of tillers (22) in early planting situation. Lowest tillers were recorded in fertilizer dose 2 in which urea was applied more and phosphorus and potash was applied less (7.89) with October planting. Similarly panicle length was highest in fertilizer dose 4 with July planting (24 cm) and lowest was recorded in fertilizer dose 3 with October planting (16.60 cm).

When we observe the grain and straw yield, highest grain yield (53.40 q/ha) and straw yield (65.37 t/ha) was recorded in fertilizer dose 4 with July

planting. Lowest grain yield (27.30 q/ha) and straw yield (32.87 t/ha) was recorded in fertilizer dose 2 with October planting. A similar result was reported by the findings of Sah *et al.* (2019) who reported the highest straw yield was for N@180 kg/ha. Singh *et al.* (2014) also reported the increment in NPK level has significantly enhanced the grain yield over its lower level.

Bastiaan (3) reported that disease loss assessments caused by leaf blast epidemics have more of an effect on yield when they occur from midtillering to pre flowering stages (reproductive stages). The N content in the paddy plant significantly influenced the insect pest and disease infestation. The higher application of nitrogen leads to profuse plant growth thereby mutual shades which reduces the photosynthesis of plant. This creates imbalance nitrogen to carbohydrate ratio which leads to accumulation of soluble nitrogen which may be responsible for ammonium toxicity in plant. Auxiliary, this might have led to augmented vulnerability of crop to pest and disease incidence (Supriya *et al.*, 2009).

Conclusion

This study carried out on the effect of staggered sowing and improper fertilizers dose on blast incidence, growth parameter and yield revealed that the delayed planting significantly contributing the blast disease incidence. Along with delayed planting, higher nitrogen fertilizer treatment recorded highest blast incidence, where as potash and phosphatic fertilizer application reduced the disease in mid planting conditions also.

Table 1: Effect of different levels of fertilizers with staggered planting in different paddy variety on incidence diseases during 2023-24 and 2024-25

Treatment	2023-24		2024-25		Pooled data	
	Leaf Blast severity DAT	Neck Blast severity at 70 DAT	Leaf Blast severity DAT	Neck Blast severity at 70 DAT	Leaf Blast severity DAT	Neck Blast severity at 70 DAT
Fertilizers level						
F ₁	7.03	9.96	6.32	8.23	6.68	9.10
F ₂	14.88	18.13	16.20	16.52	15.54	17.33
F ₃	18.65	23.73	12.58	14.24	15.62	18.99
F ₄	7.53	9.98	5.79	7.79	6.66	8.89
S. Em.±	0.52	0.73	0.73	0.73	0.63	0.73
CD (P=0.05)	1.79	2.54	2.54	2.45	2.17	2.50
Date of sowing						
D ₁	0.00	0.00	0.00	0.00	0.00	0.00
D ₂	3.17	0.63	2.13	0.00	2.65	0.32
D ₃	7.08	10.58	6.30	7.33	6.69	8.96
D ₄	15.64	22.77	10.48	13.75	13.06	18.26
D ₅	20.59	27.47	18.35	22.24	19.47	24.86

D ₆	25.66	31.27	24.09	26.85	24.88	29.06
S. Em.±	0.56	0.83	0.83	0.83	0.70	0.83
CD (P=0.05)	1.59	2.38	2.38	2.45	1.99	2.42
Fertilizer level × Date of sowing						
F1D1	0.00	0.00	0.00	0.00	0.00	0.00
F1D2	0.00	0.00	0.00	0.00	0.00	0.00
F1D3	0.00	0.00	0.00	0.00	0.00	0.00
F1D4	8.5	19.23	6.8	12.3	7.65	15.77
F1D5	14.00	18.4	12.44	14.6	13.22	16.50
F1D6	19.67	22.10	18.7	22.50	19.19	22.30
F2D1	0.00	0.00	0.00	0.00	0.00	0.00
F2D2	5.86	0.00	8.5	0.00	7.18	0.00
F2D3	12.5	18.9	15.7	16.9	14.10	17.90
F2D4	18.90	24.8	17.6	24.4	18.25	24.60
F2D5	23.37	30.5	23.4	27.4	23.39	28.95
F2D6	28.63	34.6	32	30.4	30.32	32.50
F3D1	0.00	0.00	0.00	0.00	0.00	0.00
F3D2	6.8	2.5	0.00	0.00	3.40	1.25
F3D3	15.8	23.4	9.5	12.4	12.65	17.90
F3D4	24.7	31.5	17.5	18.31	21.10	24.91
F3D5	28.9	39.8	23	26.42	25.95	33.11
F3D6	35.7	45.2	25.5	28.29	30.60	36.75
F4D1	0.00	0.00	0.00	0.00	0.00	0.00
F4D2	0.00	0.00	0.00	0.00	0.00	0.00
F4D3	0.00	0.00	0.00	0.00	0.00	0.00
F4D4	10.47	15.53	0.00	0.00	5.24	7.77
F4D5	16.10	21.17	14.54	20.52	15.32	20.85
F4D6	18.63	23.17	20.17	26.21	19.40	24.69
S. Em.±	1.14	1.70	1.70	1.69	1.42	1.70
CD (P=0.05)	3.26	4.82	4.80	4.78	4.03	4.80

Table 2: Effect of different levels of fertilizers with staggered planting on growth and yield parameters of paddy during 2023-24 and 2024-25

Treatments	2023				2024				Pooled data			
	Number of tillers	Panicle length (cm)	Grain yield (q/ha.)	Straw yield (t/ha.)	Number of tillers	Panicle length (cm)	Grain yield (q/ha.)	Straw yield (t/ha.)	Number of tillers	Panicle length (cm)	Grain yield (q/ha.)	Straw yield (t/ha.)
Fertilizers level												
F1	15.13	20.13	44.54	52.64	16.00	20.70	44.59	53.27	15.57	20.42	44.57	52.96
F2	12.90	18.04	39.33	46.05	13.67	18.72	38.92	46.85	13.29	18.38	39.13	46.45
F3	15.06	18.64	42.35	50.00	14.73	18.62	39.35	50.66	14.90	18.63	40.85	50.33
F4	17.64	21.30	46.87	55.42	18.35	20.70	45.36	55.87	18.00	21.00	46.12	55.65
SEm+	1.59	2.26	3.18	3.69	2.98	2.27	4.16	6.40	2.29	2.27	3.67	5.05
CD 5 %	5.49	7.81	11.00	12.75	10.30	7.86	14.39	22.15	7.90	7.84	12.70	17.45
Date of sowing												
D1	20.88	21.72	50.94	61.95	19.73	22.23	51.13	61.80	20.31	21.98	51.04	61.88
D2	17.86	21.30	49.22	59.41	18.63	21.43	49.75	59.76	18.25	21.37	49.49	59.59
D3	16.07	20.63	46.99	56.01	16.98	20.85	45.63	56.43	16.53	20.74	46.31	56.22
D4	13.96	19.00	42.30	48.95	14.85	19.28	41.64	49.65	14.41	19.14	41.97	49.30
D5	11.85	17.52	36.77	41.82	12.80	17.58	33.68	43.18	12.33	17.55	35.23	42.50
D6	10.49	17.00	33.41	38.03	11.15	16.75	30.52	39.17	10.82	16.88	31.97	38.60
SEm+	3.03	3.24	3.62	3.91	2.88	3.30	3.76	3.74	2.96	3.27	3.69	3.83
CD 5 %	8.66	9.27	10.35	11.17	8.22	9.43	10.76	10.68	8.44	9.35	10.56	10.93
Fertilizer level × Date of sowing												
F1D1	19.67	23.40	51.61	62.96	20.20	24.20	52.21	63.12	19.94	23.80	51.91	63.04
F1D2	18.40	23.10	50.48	61.23	19.50	23.50	51.38	62.13	18.95	23.30	50.93	61.68
F1D3	16.20	21.45	46.50	55.29	16.80	22.50	47.30	56.32	16.50	21.98	46.90	55.81
F1D4	13.70	18.90	42.15	48.73	14.80	19.30	43.25	48.80	14.25	19.10	42.70	48.77

F1D5	12.15	17.20	40.80	46.72	13.20	17.80	38.60	47.90	12.68	17.50	39.70	47.31
F1D6	10.68	16.75	35.70	40.88	11.50	16.90	34.80	41.36	11.09	16.83	35.25	41.12
F2D1	17.62	19.80	48.61	58.43	18.20	20.30	49.60	59.89	17.91	20.05	49.11	59.16
F2D2	16.80	19.20	46.31	55.11	17.60	19.80	47.30	54.91	17.20	19.50	46.81	55.01
F2D3	14.25	18.90	43.85	52.14	15.10	19.60	42.63	53.30	14.68	19.25	43.24	52.72
F2D4	12.00	18.75	39.60	45.14	12.60	19.50	38.60	44.90	12.30	19.13	39.10	45.02
F2D5	9.25	16.10	29.80	33.38	10.20	16.80	28.60	34.50	9.73	16.45	29.20	33.94
F2D6	7.48	15.50	27.80	32.11	8.30	16.30	26.80	33.62	7.89	15.90	27.30	32.87
F3D1	24.47	19.89	49.64	60.16	18.20	20.20	49.80	59.68	21.34	20.05	49.72	59.92
F3D2	16.45	19.65	47.66	57.25	17.20	19.80	48.60	58.10	16.83	19.73	48.13	57.68
F3D3	14.38	19.15	45.82	54.71	15.50	19.50	42.80	53.60	14.94	19.33	44.31	54.16
F3D4	12.75	18.56	41.64	48.51	13.60	18.80	37.80	49.80	13.18	18.68	39.72	49.16
F3D5	11.34	17.67	36.70	42.04	12.50	17.10	29.30	43.60	11.92	17.39	33.00	42.82
F3D6	10.98	16.90	32.65	37.32	11.40	16.30	27.80	39.20	11.19	16.60	30.23	38.26
F4D1	21.75	23.80	53.89	66.23	22.30	24.20	52.90	64.50	22.03	24.00	53.40	65.37
F4D2	19.80	23.25	52.44	64.03	20.20	22.60	51.70	63.90	20.00	22.93	52.07	63.97
F4D3	19.45	23.00	51.80	61.90	20.50	21.80	49.80	62.50	19.98	22.40	50.80	62.20
F4D4	17.38	19.80	45.80	53.40	18.40	19.50	46.90	55.10	17.89	19.65	46.35	54.25
F4D5	14.65	19.10	39.78	45.15	15.30	18.60	38.20	46.70	14.98	18.85	38.99	45.93
F4D6	12.80	18.85	37.50	41.81	13.40	17.50	32.68	42.50	13.10	18.18	35.09	42.16
SEm+	5.753	6.337	7.339	8.032	6.037	6.436	8.032	9.354	5.90	6.39	7.69	8.69
CD 5 %	16.443	18.114	20.976	22.956	17.254	18.396	22.956	26.736	16.85	18.26	21.97	24.85

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