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fect of foliar spraying of nutrients on seed yield, split husk occurnce and seed quality in hybrid rice ADTRH-1

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Abstract: A field experiment was conducted to know the effect of foliar spraying of nutrients on seed yield, split husk occurrence and seed quality in ADTRH-1 rice hybrid. Foliar spraying of $CuSO_4$ (0.5%), Borax (0.5%), $ZnSO_4$ (0.5%), $FeSO_4$ (0.5%), $MgSO_4$ (0.5%) or urea 2% + KH_2PO_4 0.1% + Boric acid 0.1% + $ZnSO_4$ 0.1% was given to the female plants at 50 per cent flowering and 10 days after. Results revealed that 0.5% $ZnSO_4$ recorded maximum seed set per cent, seed yield and seed quality. Split husk per cent was minimum when 0.5% $FeSO_4$ was sprayed but seed quality was also reduced significantly.

Key words : Rice hybrid, Foliar spraying, Split husk.

roduction

Hybrid rice is given increased thrust noways so as to enhance rice productivity. Hybrid well as male sterile line seed of rice face peculiar problem of split husk. The lemma d palea forming the husk do not close the ryopsis properly in a large proportion of eds. This problem is encountered only in seeds set on male sterile line (A line seed d F_1 hybrid seed) and not in B and R line eds. Male sterility may have an association ith this phenomenon.

Micronutrients have significant influence n reproductive physiology of plants (Agarwal, 979). The anthers and pollen grains are found accumulate relatively large amounts of zinc nd in turn translocated to the resultant seeds ollar, 1975). Foliar spray of 0.1 boric acid nd soil application of 10 kg $ZnSO_4$ ha^{-1} were e most effective for increasing seed yield, eed weight and germination in radish (Sharma *et al.* 1999). Foliar application of $ZnSO_4$ (0.5 er cent) could increase the grain yield significantly ver control (Manoharan *et al.* 2001). The resent investigation was made with the objective f knowing the effect of foliar application of utrients on seed set, split husk occurrence nd seed quality of rice hybrid ADTRH-1.

laterials and Methods

A field experiment was laid out at wet nd farm, Tamil Nadu Agricultural University, oimbatore during December 2000 with the parental lines (IR 58025 A x IR 66R) of rice hybrid ADTRH-1. Male line seeds were sown in the nursery 14 and 18 days after female line to achieve synchronization of flowering between the parental lines. A planting ratio of 8:2 (female to male) was followed.

The treatments details were as follows:

Treatments :

T_1 - Control
T_2 - Water spray
T_3 - $CuSO_4$ 0.5%
T_4 - Borax 0.5%
T_5 - $ZnSO_4$ 0.5%
T_6 - $FeSO_4$ 0.5%
T_7 - $MgSO_4$ 0.5%
T_8 - Urea 2% + KH_2PO_4 0.1% + Boric acid 0.1% + $ZnSO_4$ 0.1%

Plot size utilized for this study was 1.92 m^2 gross and 1.32 m^2 net. Design adopted was RBD with four replications.

The nutrient spray was given to the crop at the time of 50 per cent flowering and 10 days after. The nutrient spray was directed on the female rows. All other recommended package of practices including GA_3 spray were followed.

Five hills in each treatment in female parent were randomly selected in all the replication and the following observations were recorded:

1. Seed set per cent

The matured seeds were separated manually and the mean seed set per cent was calculated by using the following formula:

$$\text{Seed set (per cent)} = \frac{\text{Total number of filled seeds in an ear head}}{\text{Total number of seeds in an ear head}} \times 100$$

2. Split husk seed occurrence

Hundred grams of hybrid seeds were randomly taken and split husk seeds were manually separated by using a hand lens. Percentage of split husk seeds from total weight of seeds taken was calculated.

$$\text{Split husk seed (\%)} = \frac{\text{Weight of split husk seed (g)}}{\text{Total weight of seeds taken (g)}} \times 100$$

3. Seed yield plant^{-1} (g)

The ear heads from five selected hills in each treatment in the female parent were harvested at maturity stage, dried and threshed. The seeds were then cleaned and the mean seed yield plant^{-1} was recorded and expressed in g.

4. Seed yield plot^{-1} and ha^{-1} (kg)

Ear heads of the female parent from the net plot in each treatment replication wise were harvested and seeds threshed, dried and weighed to arrive at the plot yield. Seed yield obtained from the respective five selected hills were also included to arrive at the plot yield. From the plot yield, seed yield ha^{-1} was computed.

Seeds were assessed for hundred seed weight, germination (ISTA, 1999). Root and shoot length of 14 day old seedlings, dry matter production of seedlings and vigour index (germination (%) x total seedling length).

Results and Discussion

Nutrients play a major role in the reproductive physiology of plants. In the present study, seed set per cent recorded was maximum (31.: per cent) when $ZnSO_4$ (0.5 per cent) was appli as foliar spray. The reason might be due better utilization of available zinc by the pla because of exogenous supplementation. Zi application have favourable effect in poll germination, tube elongation and in decreasi the number of ruptured pollen which resul in better fertilization, higher seed set and increas seed yield. Similar beneficial effects were observ by Kumar and Singh (1997) in rice. Ne to $ZnSO_4$, spraying of Borax (0.5 per cen resulted in 5.78 per cent increase in seed s over control. Boron is also involved in poll germination, pollen tube growth and fertilizatio Similar results were also reported by Rerkase *et al.* (1997) in wheat.

Data on split husk per cent revealed th only $FeSO_4$ spraying had significantly reduc the split huk occurrence, whereas spraying $CuSO_4$, Borax and $ZnSO_4$ had significant increased the split husk occurrence. $FeSO_4$ h not only decreased the split husk occurren but also reduced the seed set per cent an seed yield though non-significantly. Further studie are required to known whether reduction o split husk occurrence was a direct effect o $FeSO_4$ or influenced indirectly through reductio in seed set and seed yield.

Seed yield was maximum when $ZnSO_4$ (0.5 per cent) was given as a foliar spray. Zinc plays a vital role as activation of carbohydrate and protein synthesis as well as their transpor to the site of seed formation. The present results were in conformity with Manoharan *et al.* (2001) in rice.

Spraying with $ZnSO_4$ registered maximum hundred seed weight of 2.048 g as compared to 2.010 g in control. Similar effect of Zn on seed weight was reported by Balakrishnan and Natarajarathinam (1986) in rice. Improvement in seed weight might be due to better translocation and accumulation of food reserves in the seeds. Seed quality as evaluated through root length, shoot length and dry matter production of seedlings revealed the positive effects of $ZnSO_4$. This could be attributed to the role of zinc in the production of more energy as metal component of NAD and NADP linked dehydrogenases for

Treatments	Seed set (%)	Split husk seed (%)	Seed yield plant^{-1} (g)	Seed yield plot^{-1} (g)	Seed yield ha^{-1} (g)	100 seed weight	Germination (%)	Root length (cm)	Shoot length (cm)	Dry matter production (mg 10 seedlings^{-1})	Vigour index
T_1 - Control	22.48	31.38	4.25	0.074	566	2.010	86 (67.79)	18.7	12.2	130	2642
T_2 - Water spray	23.65	32.50	5.00	0.076	573	2.018	78 (61.70)	19.1	12.9	130	2485
T_3 - $CuSO_4$ 0.5%	26.85	38.38	5.00	0.101	763	1.973	82 (65.41)	20.2	13.0	131	2737
T_4 - Borax 0.5%	28.23	36.25	6.00	0.146	802	1.940	89 (70.32)	21.6	12.9	132	3052
T_5 - $ZnSO_4$ 0.5%	31.53	34.63	8.00	0.180	1215	2.048	90 (71.29)	22.1	14.8	136	3286
T_6 - $FeSO_4$ 0.5%	21.78	27.38	4.00	0.063	492	2.033	81 (63.86)	19.1	12.3	129	2528
T_7 - $MgSO_4$ 0.5%	24.26	30.88	5.00	0.097	665	2.045	80 (63.14)	19.4	11.5	127	2456
T_8 - Urea 2% + KH_2PO_4 0.1% + Boric acid 0.1% + $ZnSO_4$ 0.1%	27.26	31.70	6.00	0.113	997	1.983	87 (68.54)	22.6	13.9	135	3162
Mean	25.76	32.88	5.53	0.100	759	2.006	84 (66.51)	20.4	12.9	131	2793
SEd	0.722	0.873	0.758	0.007	53.107	0.011	2.132	1.170	0.661	1.937	136.26
CD (P=0.05)	1.502	1.816	1.577	0.014	10.442	0.023	4.435	2.433	1.375	4.028	283.38

(Figures in parentheses indicate arcsine values)

catalyzing the oxidation processes, besides in stimulating the synthesis of IAA, nucleic acid and proteins (Mengel and Kirkby, 1996).

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