Effect of post emergence herbicide 2,4-D Sodium salt on yield components and yield of Rice

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Abstract-Field investigation was carried out at Annamalai University, Experimental Farm, Annamalai Nagar to study the effect of post emergence herbicide 2,4-D Sodium salt on growth of rice during samba season (August- December 2021) in a randomized block design with eight treatments and three replications. The treatments comprised of different weed management practices *viz* ., T_1 - 2,4-D Sodium Salt (Formulation Dose 1000 g ha^{-1}), T_2 - 2,4-D Sodium Salt (Formulation Dose 1250 g ha^{-1}), T_3 - 2,4-D Sodium Salt (Formulation Dose 1500 g ha^{-1}), T_4 - 2,4-D Ethyl Ester 38% EC (Formulation Dose 2500 g ha^{-1}), T_5 - Metsulfuron methyl 10% + Chlorimuron ethyl 10% WP (Formulation Dose 20 g ha^{-1}), T_6 - Hand Weeding, T_7 - Unweeded control and T_8 - 2,4-D Sodium Salt (Formulation Dose 2500 g ha^{-1}). Among the various herbicide treatments tested, post-emergence herbicide 2,4-D Sodium salt @ 1500 g ha^{-1} on 20 DAT (T_3) favouring higher yield attributes *viz.*, Number of panicles, Number of filled grains panicle, Test weight, Grain yield, Straw yield and Harvest index of rice and hand weeding twice on 20 and 40 DAT (T_6) was next in order. The treatment T_2 - 2,4-D Sodium Salt (Formulation Dose 1250 g ha^{-1}), and T_5 - Metsulfuron methyl 10% + Chlorimuron ethyl 10% WP (Formulation Dose 20 g ha^{-1}), were on par with each other. Highest weed population, weed biomass, least yield attributes and grain yield of rice were recorded in control (T_7).

Keywords: 2,4-D Sodium salt, Hand weeding, 2,4-D Ethyl ester.

INTRODUCTION

In India, Rice is the staple food for millions of people and plays a vital role in the economy. Rice is one of the most important cereals and major staple food for more than half of global population and considered as the "Global Grain". Rice (*Oryza sativa* L.) is the main staple food crop of India covering an area of about 44.6 million hectares with production of 90 million tonnes (Shekhawat *et al*., 2010), but the productivity level is very low (2.97 t ha-^{1}) and assures food security in India for more than half of the total population.

Rice occupies a pivotal place in Indian agriculture and is grown on more than 44 million hectares and accounts for about 43 per cent of total food grain production in the country (Pradhan *et al*., 2013). The average global total rice cultivated area is 167 million hectare and production of 782 million tonnes with the productivity of 4.67 t ha^{-1} (FAOSTAT, 2020). In India the area under rice cultivation is 43.66 million hectares having annual production of 118.87 million tonnes with a productivity of 4.08 t ha^{-1} (USDA, 2021). The average productivity of rice in India is only 4.1 t ha^{-1} against the global average of 4.67 t ha^{-1} (FAS, 2021). In Tamil Nadu rice is grown with an area of 18.50 lakh hectares with a production of 72.00 lakh metric tonnes and a productivity of 3.89 t ha^{-1} (https://cms.tn.gov.in). About 90 per cent of all rice grown in the world is produced and consumed in the Asia region. Rice cultivation suffers from various biotic and abiotic constraints.

Weed competition is one of the primary yield-limiting biotic constraints in rice. There are several reasons for low productivity and the major is due to weeds. Weeds compete with rice for moisture, nutrient, light, temperature and space. Uncontrolled weeds have caused yield reduction of 28 to 45 per cent in transplanted rice (Manhas *et al*., 2012). Many pre and post-emergence herbicides were identified for effective control of weeds in transplanted rice (Rajkhowa *et al*., 2006), (Rao *et al*., 2017). The goal of herbicides use is to kill or to manage the weed menace or stunt weed infestation allowing the rice to grow and gain a competitive advantage. The chemical weed control method is becoming popular and an effective one among the farmers because it is the most efficient means of reducing weed competition with minimum labour cost. An assessment of the performance of different herbicides in transplanted rice, provides a wide weed control spectrum and also will be economically viable and environmentally safe (Rajender Kumar *et al*., 2018).

MATERIALS AND METHODS

Field investigation were carried out in the plot number M-2 of wetland block, Experimental farm, Department of Agronomy, Annamalai University, Annamalai Nagar, during Samba season, 2021. The experimental farm is located at 11°24' N latitude, 79°44' E longitude and at an altitude of +5.79 m above from the mean sea level. The weather at Annamalai Nagar is moderately warm with the hot summer months. During cropping period the maximum temperature ranged from 38.6 to 27.4℃ with a mean of 33℃ and the minimum temperature ranged from 24.7 to 19.5℃ with a mean of 22.1℃. The Relative Humidity ranged from 95 to 81 per cent with a mean of 88 per cent. The soil of the experimental field is classified as clay loam in texture.

The treatments comprised of different weed management practices *viz* ., T_1 - 2,4-D Sodium Salt (Formulation Dose 1000 g ha^{-1}), T_2 - 2,4-D Sodium Salt (Formulation Dose 1250 g ha^{-1}), T_3 - 2,4-D Sodium Salt (Formulation Dose 1500 g ha^{-1}), T_4 - 2,4-D Ethyl Ester 38% EC (Formulation Dose 2500 g ha^{-1}), T_5 - Metsulfuron methyl 10% + Chlorimuron ethyl 10% WP (Formulation Dose 20 g ha^{-1}), T_6 - Hand Weeding, T_7 - Unweeded control and T_8 - 2,4-D Sodium Salt (Formulation Dose 2500 g ha^{-1}).

RESULT AND DISCUSSION

Effect on yield and yield parameters

Application of post-emergence herbicide 2,4-D Sodium salt on 20 DAT (T3) performed significantly superior than other herbicides by registering the highest yield components *viz*., productive tillers and filled grains $panicle^{-1}$. Among the various treatments, application of post emergence herbicide 2,4-D Sodium salt @ 1500 g ha^{-1} on 20 DAT (T3) significantly recorded the highest number of panicles m^{-2} (267), number of filled grains $panicle^{-1}$ of 97.24 which leads to highest grain yield of 5150 kg ha^{-1}, straw yield of 6985 kg ha^{-1} and harvest index of 42.43 per cent. There was no significant difference noticed in test weight due to the influence of weed control treatments as the character of test weight is governed by genetic factor. The better removal of weeds at early stage favored the vigorous growth of seedling, without any crop weed competition and sustained nutrient availability leads to better uptake of NPK by the crop might have contributed to the increased yield attributes which had over all favourable impact on increased grain and straw yield (Bhimwal and Pandey, 2014). It was followed by hand weeding twice on 20 and 40 DAT which recorded the next highest grain and straw yield. The lowest grain and straw yields were recorded in unweeded control. This was conformity with the findings of Narayanan (2000).

CONCLUSION

Based on above findings, 2,4-D Sodium salt 1500 g ha^{-1} (T_3), recorded the maximum Number of $panicles^{-2}$, Number of filled grains $panicle^{-1}$ which tend to acquire highest grain and straw yield and hence, it is considered to be the best recommendation for rice farmers

TREATMENTS	Number of panicles m^{-2}	Number of filled grains $panicle^{-1}$	Test weight (g)	Grain yield	Straw yield	Harvest index
T_1 – 2,4-D Sodium salt (F.D – 1000 g ha^{-1})	232	88.2	22.28	4291	6004	41.68
T_2 – 2,4-D Sodium salt (F.D – 1250 g ha^{-1})	244	91.2	22.54	4705	6475	42.08
T_3- 2,4-D Sodium salt (F.D – 1500 g ha^{-1})	267	97.24	23.01	5150	6985	42.43
T_4- 2,4-D Ethyl ester 38% EC (F.D – 2500 g ha^{-1})	222	85.6	22.21	4034	5735	41.29
T_5- Metsulfuron methyl 10% + Chlorimuron ethyl 10% WP (F.D – 20 g ha^{-1})	242	90.8	22.34	4540	6265	42.01
T_6- Hand Weeding	256	94.04	22.83	4931	6734	42.27
T_7- Unweeded Control	180	75.8	22.03	2942	4702	38.48
T_8- 2,4-D Sodium salt (F.D – 2500 g ha^{-1})	212	82.8	22.15	3749	5461	40.70
S. Em ±	3.36	0.90	0.02	74.46	87.94	0.04
C.D (P=0.05)	9.5	2.54	NS	210	248	NS

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