

Studies on effect of post emergence herbicide 2,4-D Sodium salt on growth 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.*, T₁ - 2,4-D Sodium Salt (Formulation Dose 1000 g ha⁻¹), T₂ - 2,4-D Sodium Salt (Formulation Dose 1250 g ha⁻¹), T₃ - 2,4-D Sodium Salt (Formulation Dose 1500 g ha⁻¹), T₄ - 2,4-D Ethyl Ester 38% EC (Formulation Dose 2500 g ha⁻¹), T₅ - Metsulfuron methyl 10% + Chlorimuron ethyl 10% WP (Formulation Dose 20 g ha⁻¹), T₆ - Hand Weeding, T₇ – Unweeded control and T₈ - 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 (T₃) favouring higher growth attributes *viz.*, Plant height, LAI, DMP, grain and straw yield of rice and hand weeding twice on 20 and 40 DAT (T₆) was next in order. The treatment T₂ - 2,4-D Sodium Salt (Formulation Dose 1250 g ha⁻¹), and T₅ - Metsulfuron methyl 10% + Chlorimuron ethyl 10% WP (Formulation Dose 20 g ha⁻¹), were on par with each other. The least yield attributes and grain yield of rice were recorded in control (T₇).

Key word : 2,4-D Sodium salt, Metsulfuron methyl 10% + Chlorimuron ethyl, 2,4-D Ethyl ester.

Rice is a supreme commodity to mankind, because rice is in our life, culture, tradition and a mean of livelihood to millions. In recognition to these important traits, the United Nations declared the year 2004 as the International Year of Rice. Next to China, India contributes 21.5 per cent of global rice production. Rice occupies a pivotal place in Indian agriculture and is grown on more than 44 million hectares and accounts for about 43

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per cent of total food grain production in the country⁷.

The average global total rice cultivated area is 167 million hectare and production of 782 million tonnes with the productivity⁴ of 4.67 t ha⁻¹. In India the area under rice cultivation is 43.66 million hectares having annual production of 118.87 million tonnes with a productivity⁹ of 4.08 t ha⁻¹. The average productivity of rice in India is only 4.1 t ha⁻¹ against the global average⁵ of 4.67 t ha⁻¹. 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>). 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 tonnes⁸, 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. 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. Use of post emergence herbicide has greater potential for effective weed management and higher yield¹⁰. 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. Recent trend of herbicide use is to find out the effective weed control measures using low dose high efficiency herbicides which not only reduce the total

volume of herbicides but also the application becomes easier and economics¹.

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°C with a mean of 33°C and the minimum temperature ranged from 24.7 to 19.5°C with a mean of 22.1°C. 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.*, T₁ - 2,4-D Sodium Salt (Formulation Dose 1000 g ha⁻¹), T₂ - 2,4-D Sodium Salt (Formulation Dose 1250 g ha⁻¹), T₃ - 2,4-D Sodium Salt (Formulation Dose 1500 g ha⁻¹), T₄ - 2,4-D Ethyl Ester 38% EC (Formulation Dose 2500 g ha⁻¹), T₅ - Metsulfuron methyl 10% + Chlorimuron ethyl 10% WP (Formulation Dose 20 g ha⁻¹), T₆ - Hand Weeding, T₇ - Unweeded control and T₈ - 2,4-D Sodium Salt (Formulation Dose 2500 g ha⁻¹).

Growth characters :

The growth characters were significantly influenced by application of post-emergence herbicide 2,4-D Sodium salt on 20 DAT (T₃)

Table-1. Effect of post emergence herbicide 2,4-D Sodium salt on growth of rice

Treatments	Plant height (cm)			LAI	DMP (kg ha ⁻¹)			Grain yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)
	30 DAT	60 DAT	At harvest	Flowering Stage	Tillering Stage	Flowering Stage	At Harvest		
T1 - 2,4-D Sodium salt (F.D-1000 g ha ⁻¹)	58.72	80.35	87.54	3.78	5919	7364	9969	4291	6004
T2 - 2,4-D Sodium salt (F.D - 1250 g ha ⁻¹)	62.38	84.94	95.14	4.68	5363	8036	10813	4705	6475
T3- 2,4-D Sodium salt (F.D - 1500 g ha ⁻¹)	67.5	92.27	104.39	5.85	5807	8719	11698	5150	6985
T4- 2,4-D Ethyl ester 38% EC (F.D - 2500 g ha ⁻¹)	56.12	76.15	83.44	3.23	4642	6937	9518	4034	5735
T5- Metsulfuron methyl 10%+Chlorimuron ethyl 10% WP (F.D-20 g ha ⁻¹)	61.28	83.64	92.64	4.47	5188	7761	10418	4540	6265
T6- Hand Weeding	64.97	89.04	100.04	5.59	5592	8375	11259	4931	6734
T7- Unweeded Control	47.05	66.3	74.14	2.01	3615	5561	7846	2942	4702
T8- 2,4-D Sodium salt (F.D - 2500 g ha ⁻¹)	53.15	71.55	79.24	2.97	4333	6468	9077	3749	5461
S. Em ±	0.88	1.13	1.38	0.08	74.82	115.24	154.96	74.46	87.94
C.D (P=0.05)	2.5	3.21	3.9	0.24	211	325	437	210	248

recorded highest plant height (67.38, 92.27 and 104.39 cm) at 30, 60 DAT and at harvest stage and maximum leaf area index (5.85) at flowering stage, dry matter production of (5807, 8719 and 11698 kg ha⁻¹) at tillering, flowering and harvest stage, grain yield (5150 kg ha⁻¹) and straw yield (6985 kg ha⁻¹) Table 1. It was followed by (T₆) – Hand weeding. The control of weeds up to the critical period of crop weed competition by application of post-emergence herbicide 2,4-D Sodium salt on 20 DAT (T₃) led to better crop growth, crop canopy and effective utilization of available nutrients which ultimately resulted in increased dry matter production. Dry matter accumulation

of crop was inversely proportional to the dry weight of weeds. This increase growth yield parameters might be due to broad spectrum of weed control and selectivity to rice crops. The findings falls in conformity with the results of Babu *et al.*². It also performed significantly superior than the other herbicides by registering higher grain and straw yield over control. 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

similar result was also reported^{3,6}. The crop weed competition is the result of an effective control of weeds that had caused reduced growth characters values in unweeded plot. The least growth characters was recorded under unweeded control (T₇).

Based on above findings, 2,4-D Sodium salt 1500 g ha⁻¹ (T₃), recorded the maximum plant height, Leaf Area Index, and Dry matter production which tend to acquire highest grain and straw yield and hence, it is considered to be the best recommendation for rice farmers.

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