

Effect of 2, 4-D Ethyl Ester 80 % EC on weed control in wheat

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ABSTRACT

A field experiment was conducted during winter at Regional Research Station, BCKV, Chakdaha of West Bengal with eight - weed control treatments viz. four different doses of 2, 4 - D EE 80 per cent EC @ 0.225, 0.450, 0.675 and 0.900 a.i. kg ha⁻¹, 2, 4-D EE 38 per cent EC @0.450 a.i. kg ha⁻¹, Metsulfuron methyl 20 per cent WP@ 0.004 a.i. kg ha⁻¹, hand weeding twice at 25 and 45 DAS and unweeded control - in a randomized block design replicated thrice. The post emergence application of 2, 4-D EE 80 per cent EC @ 0.900 a.i. kg ha⁻¹ - resulted in effective weed control, recording the least weed density and weed dry weight among the chemical weed control treatments. Hand weeding twice produced highest grain yield followed by 2, 4-D EE 80 per cent EC @ 0.900 a.i. kg ha⁻¹. No phytotoxicity symptoms were observed throughout the observations.

Keywords : 2, 4-D Ethyl Ester, grain yield, metsulfuron-methyl, phytotoxicity, weeds

Wheat (*Triticum aestivum* L.) is the second important food crop-after rice in India. Besides staple food for human beings, wheat straw is a good source of feed for a large population of cattle in our country (Singh, 2013). It is grown in about 31.19 million ha area in the country with the production of 95.91 million tonnes (Agril. Statistics, 2014).

In West Bengal, it is grown in 0.34 million ha area with the production of 0.95 million tones and productivity of 2802 kg ha⁻¹ (Agril. Statistics, 2014). A major concern about weed management in the agricultural scenario is persistence, mobility, and bioavailability of pesticide residues in the environment (Sachan *et al.*, 2007). Weeds compete with crop plants for nutrients, light, space, moisture and many other growth (Gupta, 2004). Uncontrolled weeds are reported to cause up to 66 per cent reduction in wheat grain yield or even more depending upon the weed density, type of weed flora and duration of infestation (Kumar *et al.*, 2011). Hand weeding recorded highest grain yield followed by clodinafop + 2, 4-D EE treatment, which were 48.1 and 38.9 per cent higher over weedy check respectively (Barui *et al.* 2006). Singh *et al.* (2015) recorded that metribuzin + clodinafop-propargyl at 500-600 g ha⁻¹ were as effective as two hand weeding at 30 and 50 DAS in reducing the weed density at 30 and 60 days after application as compared to rest treatments.

Explain more about the importance of weed management in wheat and also about the herbicide 2, 4-D EE.

MATERIALS AND METHODS

A field experiment was conducted to study the effect of “bio-efficacy and phytotoxicity of 2, 4-D Ethyl Ester

80 and 38 per cent EC in wheat” in *rabi* season of 2012-13 at Regional Research Station (2805.3' N latitude and 8305.3' E longitude and the altitude of 9.75 m above mean sea level), BCKV, Chakdaha, West Bengal. The experiment was laid out in randomized block design with three replications comprising eight different weed control treatments viz. four different doses of 2, 4-D EE 80 per cent EC (Nufarm) applied at 0.225, 0.450, 0.675 and 0.900 a.i. kg ha⁻¹, 2, 4-D EE 38 per cent EC (Commercial) at 0.450 a.i. kg ha⁻¹, metsulfuron methyl 20 per cent WP at 0.004 a.i. kg ha⁻¹, hand weeding twice at 25 and 45 DAS and unweeded control. Wheat variety ‘PBW 343’ was sown in 20 cm spacing using 100 kg seed ha⁻¹ on December 07, 2012. Herbicidal treatments were applied as post emergence (after first irrigation) 34 days after sowing at their respective doses as per treatments. Spraying was done with the help of knapsack sprayer fitted with a flat fan nozzle with the spray volume of water 500 l/ha. Weed population was taken by quadrat method and dry weight was done as per standard method. The weeds inside each quadrat were uprooted, cleaned and dried. After sun drying, weeds were dried for 48 hours to obtain a constant weight. After drying, weight and weed control efficiency was calculated using standard formula. The treatments were allocated randomly to different plots with the help of random number table (Fisher and Yates, 1953) and the data were analysed by ANOVA, and ranked by using the critical difference - at 5 per cent level.

RESULTS AND DISCUSSION

Weed Density

The total weed density was significantly reduced in the herbicide treatments. The data on weed count has

Table 1: Effect of treatments on weed density - in wheat during *rabi* 2012-13

Treatments	Dose (a.i. kg ha ⁻¹)	Broad leaf weed (No. m ⁻²)						Grassy weed (No. m ⁻²)						Sedge weed (No. m ⁻²)						Total weed population (No. m ⁻²)					
		20		40		60		20		40		60		20		40		60		20		40		60	
		DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	
2,4-D EE 80% EC (Nufarm)	0.225	1.03	2.07	3.62	0.38	0.89	1.62	0.70	1.27	1.92	2.01	4.23	7.39												
2,4-D EE 80% EC (Nufarm)	0.450	0.98	1.44	2.07	0.30	0.56	0.74	0.60	1.02	1.51	1.98	3.00	4.32												
2,4-D EE 80% EC (Nufarm)	0.675	0.92	1.38	1.91	0.28	0.53	0.73	0.59	0.93	1.24	1.89	2.95	3.89												
2,4-D EE 80% EC (Nufarm)	0.900	0.92	1.18	1.78	0.23	0.51	0.60	0.58	0.62	1.09	1.67	2.31	3.29												
2,4-D EE 38% EC (Commercial)	0.450	0.99	1.45	2.53	0.32	0.60	0.93	0.69	1.06	1.61	1.99	3.07	5.38												
Metsulfuron methyl 20% WP	0.004	1.02	1.61	3.43	0.36	0.89	1.24	0.70	1.20	1.87	2.00	3.43	6.23												
Hand weeding twice at 25 & 45 DAS	-	0.58	0.90	1.47	0.11	0.43	0.43	0.41	0.48	0.78	1.11	2.00	3.00												
Control (Unweeded check)	-	3.43	4.11	5.47	0.75	1.07	1.85	2.06	3.75	3.04	6.23	8.93	10.13												
SE (d)		0.05	0.10	0.15	0.02	0.04	0.06	0.02	0.06	0.07	0.28	0.39	0.40												
LSD(0.05)		0.12	0.22	0.32	0.03	0.08	0.12	0.05	0.14	0.15	0.60	0.83	0.86												

Note: EE= Ethyl Ester, EC= Emulsified concentration, WP= Wettable powder, a.i. = Active ingredient, L= Litre, DAS= Days after sowing

Table 2: Effect of treatments on weed dry matter accumulation, weed control efficiency, phytotoxicity and grain yield of wheat during *rabi* 2012-13

Treatments	Dose (a. i. kg ha ⁻¹)	Weed dry matter accumulation (g m ⁻²)						Weed control efficiency (%)						Phytotoxicity observation						Grain yield (t ha ⁻¹)
		20		40		60		20		40		60		7		14		21		
		DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAS	DAHA	DAHA	DAHA	DAHA		
2,4-D EE 80% EC (Nufarm)	0.225	0.97	3.24	8.47	26.52	0.61	17.20	0	0	0	1.39									
2,4-D EE 80% EC (Nufarm)	0.450	0.73	2.00	7.21	44.70	38.65	29.52	0	0	0	1.70									
2,4-D EE 80% EC (Nufarm)	0.675	0.63	2.00	7.21	52.27	38.65	29.52	0	0	0	1.70									
2,4-D EE 80% EC (Nufarm)	0.900	0.61	1.63	7.20	53.79	50.00	29.62	0	0	0	1.72									
2,4-D EE 38% EC (Commercial)	0.450	0.86	2.39	8.20	34.85	26.69	19.84	0	0	0	1.42									
Metsulfuron methyl 20% WP	0.004	0.87	3.21	8.27	34.09	1.53	19.16	0	0	0	1.40									
Hand weeding twice at 25 & 45 DAS	-	0.50	1.50	6.23	62.12	53.99	39.10	0	0	0	1.85									
Control (Unweeded check)	-	1.32	3.26	10.23	-	-	-	0	0	0	1.32									
SE (d)		0.03	0.15	0.47	-	-	-	-	-	-	0.21									
LSD(0.05)		0.07	0.32	0.99	-	-	-	-	-	-	NS									

Note: EE= Ethyl Ester, EC= Emulsified concentration, WP= Wettable powder, a.i. = Active ingredient, L= Litre, DAS= Days after sowing, DAHA=Days after herbicide application

revealed that 2, 4-D EE 80 % EC (Nufarm) @ 0.900 a.i. kg ha⁻¹ has resulted in effective control of all type of weeds and has recorded least weed count at 20, 40 and 60 DAS (remained on a par among themselves) and superior to the other treatments except hand weeding twice. 2, 4-D EE 80 % EC (Nufarm) @ 0.900 a.i. kg ha⁻¹ was on a par with 2, 4-D EE 80 % EC (Nufarm) 0.675 a.i. kg ha⁻¹ in controlling the total weed population. The unweeded control treatment recorded the highest weed count at all the observations with the pre dominance of broad leaf weeds followed by sedges and grasses respectively.

Weed dry weight and weed control efficiency

Significant differences in DMP were observed among the treatments at all the stages. At 20, 40 and 60 DAS, the lowest DMP of 0.50, 1.50 and 6.23 g m⁻² was recorded in hand weeding twice followed by 2, 4-D EE 80 per cent EC (Nufarm) @ 0.900 and 0.675 a.i. kg ha⁻¹ respectively. The weed control efficiency derived from the weed dry weight revealed, hand weeding twice resulted with the higher weed control efficiency of 62.12, 53.99 and 39.10 per cent during 20, 40 and 60 DAS respectively. This was followed by 2, 4-D EE 80 per cent EC (Nufarm) @ 0.900 a.i. kg ha⁻¹ (53.79, 50.00 and 29.62 per cent at 20, 40 and 60 DAS respectively) and - 0.675 a.i. kg ha⁻¹ (52.27, 38.65 and 29.52 per cent at 20, 40 and 60 DAS respectively). The weed control efficiency of the aforesaid treatments remained comparable with each other and better than other treatments. The lowest WCE was recorded in unweeded control plot.

Yield of wheat

Hand weeding twice recorded the highest grain yield of 1.85 t ha⁻¹ which was followed by 2, 4-D EE 80 per cent EC (Nufarm) @ 0.900 a.i. kg ha⁻¹ (1.72 t ha⁻¹), 2, 4-D EE 80 per cent EC (Nufarm) @ 0.675 a.i. kg ha⁻¹ (1.70 t ha⁻¹) and 2, 4-D EE 80 per cent EC (Nufarm) @ 0.450 a.i. kg ha⁻¹ (1.70 t ha⁻¹) respectively.

Phytotoxicity

The observation on visual crop toxicity was done 07, 14 and 21 days after herbicide application (DAHA). The visual crop toxicity symptoms like leaf injury, vein clearing, epinasty, hyponasty, scorching and necrosis were observed. There were no crop phytotoxicity

symptoms among the different treatments as well as at the highest dose of 2, 4-D EE 80 % EC (Nufarm) @ 0.900 a.i. kg ha⁻¹.

From the above study, it is inferred that 2, 4-D EE 80 per cent EC (Nufarm) @ 0.900 and 0.675 a.i. kg ha⁻¹ has resulted in effective weed control, recording the least weed density and weed dry weight and there by higher weed control efficiency after manual weeding twice treatment plot. In case of yield, 2, 4-D EE 80 per cent EC (Nufarm) @ 0.900 a.i. kg ha⁻¹ resulted better yield after manual weeding twice plot which was *on par* with aforesaid treatments. 2, 4-D ethyl ester 80 per cent EC tested at different doses for phytotoxicity has revealed that there is no phytotoxicity symptom observed in any of the doses and the tested new formation is safe to the wheat crop.

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