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Impact of pre- and post-harvest weedicides on weed control efficiency of wheat (*Triticum aestivum* L.)

Deepika Mujalde, VK Paradkar and Ravikant Soni

Abstract
The experiment was conducted in field of the Zonal Agriculture Research station, Chhindwada (M.P.). The experiment was laid out in Randomized Block Design (RCBD) with three replications and each replication consists of twelve treatments 2019-20 and 2020-21. All the treatments were randomized separately in each replication, on the basis of current experiment**,** the treatment T_1-Weed control (unweeded), T_2-Hand weeding, T_3-Metribuzin (PE), T_4-Oxyfluorfen (PE), T_5-Atrazin (PE), T_6-Pendimethalin (PE), T_7-Metasulfuron (POST), T_8-2,4D Amino salt (POST), T_9-Sulfosulfuron (POST), T_{10}-2,4-D Zura (Dimethyl) (POST), T_{11}-2,4-D Ethylin ester (POST) and T_{12}-Isoproturon (POST). On the basis of evaluation, the different treatments, the application of Oxyfluorfen (PE) as pre-emergence show minimum weed dry weight and maximu weed control efficiency.

Keywords: Weed control efficiency, weed dry weight, Oxyfluorfen, pre-emergence

Introduction
Wheat (*Triticum aestivum* (L.) is widely grown winter cereal and is the backbone of food security in India. Wheat is grown only in the rabi season (winter). It is planted in late November through the end of January and harvested in April. Wheat cultivation in India has traditionally been dominated by the northern region of India. The northern states of Punjab and Haryana Plains in India have been prolific wheat producers. Major wheat-growing states in India are Uttar Pradesh, Punjab, Haryana, Madhya Pradesh, Rajasthan, Bihar, and Gujarat. Wheat grains are grounded into flour (atta) and consumed in the form of chapatee i.e. 80 85%. It is a universal staple food for 40% human population in the world and second most important cereal after rice (Dwivedi *et al*., 2012) [4]. Uttar Pradesh and Madhya Pradesh produce 50% of the total quantity of Wheat produced in the country.

It is rich in carbohydrate, protein, fat and minerals (zinc, iron) and also contains good amount of vitamins such as thiamine and vitamin-B. Wheat is also a good source of essential dietary substances like carotenoids, flavonoids and phenolic compounds.

World trade in wheat is greater than for all other crops combined. The demand for India's wheat in the world shows a rising trend. The country has exported 7,239,366.80 MT of wheat to the world for the worth of Rs. 15,840.31 crores/ 2,121.72 USD Millions during the year 2021-22. (Anonymous 2022) [6]

The massive importance of wheat can be understood with the figures of grown area of 215.48mha with annual production of 731.46 mt and productivity of 33.9 q/ha during 2018-19 worldwide. The area and production of the Madhya Pradesh is 72.22 lakh ha and 252.76 lakh tons respectively. India is a second largest producer of the wheat after China. In India huge portion of total cultivation devoted under this crop, nearly 29.14mha area with annual production of 102.19 mt carrying average productivity of 3506.8 kg/ha in year 2018-19 (Anonymous 2019) [2].

The importance of herbicides for wheat control in wheat crop is extensively studied, but there is very limited research about the effects of herbicides on the nutrient aspect of wheat grain. However, the dietary value of wheat is enormously important as wheat takes an important place among the crop species being widely grown as staple food sources.

Materials and Methods
The experiment was conducted in field of the Zonal Agriculture Research station, Chhindwara (M.P.) The topography of the field was uniform with proper drainage. A field experiment was laid out in a randomized block design comprising of 12 treatments with 3 (three) replications as per the plan of layout.

This experiment was conducted during the *Rabi* season 2019-20 and 2020-21. Chhindwara is located at 22.07° North latitude and 78.93° East longitudes and at an altitude of 686 meters above mean sea level. Maximum temperature ranged between 30 °C to 82.7 °C while minimum temperature ranged between 18.2 °C and 19.7 °C during this season. The rainfall here is around 1266 mm (49.8 inch per year). The highest temperature recorded in the month of May at around 33.8 °C whereas January is the coldest month with temperature 18.6 °C. Temperatures in the summer range from 25 to 45 °C, while the temperature in winter is 10 to 25 ºC. The soil of the chindwara region is broadly classified as Vertisols as per norms of United State (US) classification of soil. It has medium to deep depth and black in colour. It has ability to as well after wetting and to shrink after drying. It is obvious from the soil analysis data that the soil of the experimental field was clayey in texture. It was medium in organic carbon (0.64%), available nitrogen (370 kg N ha-1) and phosphorus (16.45 kg P205 ha-') but high in available potassium (295 kg K20 ha"1). The soil was nearly neutral in reaction (7.2 pH) and concentration of soluble salts (0.32 dS m"1) was below to the harmful limit.

Results and Discussion

Weed dry weight

The data on weed dry weight at 30 DAS was significantly influenced by various treatments of weed management and the minimum weed dry weight (1.52 in 2019-20 and 1.77 in 2020-21) was recorded in the treatment T_4- Oxyfluorfen (PE) followed by T_5- Atrazin and T_6- Pendimethalin as applied pre emergent weedicide. while maximum weed dry weight (18.64g in 2019-20 and 19.01 in 2020-21) was recorded in the treatment T_1- Weed control (un weeded).

The mean data of both years as significantly influenced by pre and post emergence herbicides and the minimum weed dry weight (1.65) was recorded in the treatment T_4- Oxyfluorfen as applied pre-emergent weedicide followed by other treatments and it was statistically at par with the treatment T_5 (2.01) and T_6 (2.24). While the maximum weed dry weight (18.82) was recorded in the treatment T_1- Weed control (un weeded).

The application of pre-emergent weedicide Oxyfluorfen in the treatment T-4 the data on weed dry weight at 60 and 90 DAS were significantly influenced by various treatments of weedicides and the same pattern were followed in both of the years. And pooled also. The oxyfluorfen control weeds by inhibition action of essential enzymes protoporphyrinogen oxidase during weed growth and minimum dry weight might also be due to the less density of weeds in particular treatments. The closed finding of the research is Ahmed *et al.* (2010) [1] and Malekian *et al.* (2013) [5].

Weed control efficiency

The weed control efficiency was recorded at 30, 60 and 90 days after sowing as presented in Table 2 and graphically illustrated in Fig 2. Among all the weed management treatments, the weed control efficiency at 30 DAS was significantly influenced by various treatments of weedicides and maximum weed control efficiency (91.84% in 2019-20 and 90.68% in 2020-21) was recorded in the treatment T_4- Oxyfluorfen (PE) while the minimum weed control efficiency (0.00% in 2019-20 and 0.00% in 2020-21) was recorded in the treatment T_1- Weed control (unweeded).

The mean data of both years as significantly influenced by pre and post emergence herbicides and the maximum weed control efficiency (91.23%) was recorded in the treatment T_4- Oxyfluorfen (PE) while the minimum weed control efficiency (0.00%) was recorded in the treatment T_1- Weed control (unweeded). The application of different weed management practices, the application of Oxyfluorfen in the treatment T-4 show significant difference among the treatments at 60 and 90 DAS and the same pattern were followed in both of the years and pool also. The mean of two years as significantly influenced by pre and post emergence herbicides and the maximum weed control efficiency was recorded in the treatment T_4- Oxyfluorfen (PE) might be due to the oxyfluorfen reduce the weed growth at every crop growth period and control most of weeds by inhibition action of enzyme. The same findings are Ahmed *et al.* (2010) [1] and Malekian *et al.* (2013) [5].

Table 1: Impact of pre- and post-harvest weedicides on weed dry weight of wheat

S.N.	Treatments	Weed dry weight								
		30 DAS			60 DAS			90 DAS		
		2019-20	2020-21	Pooled	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled
T_1	Weed control (unweeded)	18.64	19.01	18.82	64.56	63.39	63.98	86.30	86.44	86.37
T_2	Hand weeding	2.75	2.78	2.77	36.65	35.38	36.02	63.23	63.35	63.29
T_3	Metribuzin (PE)	7.36	7.62	7.49	18.36	18.39	18.38	25.03	25.53	25.28
T_4	Oxyfluorfen (PE)	1.52	1.77	1.65	4.10	4.27	4.18	4.30	4.44	4.37
T_5	Atrazin (PE)	1.87	2.16	2.01	9.88	8.26	9.07	6.10	6.15	6.12
T_6	Pendimethalin (PE)	2.06	2.42	2.24	10.62	10.04	10.33	11.43	11.64	11.54
T_7	Metasulfuron (POST)	5.59	5.23	5.41	18.99	19.10	19.04	64.07	64.10	64.08
T_8	2,4D Amino salt (POST)	5.96	5.65	5.81	45.50	45.50	45.50	19.23	19.35	19.29
T_9	Sulfosulfuron (POST)	6.36	6.72	6.54	54.53	54.61	54.57	66.70	67.04	66.87
T_{10}	2,4-D Zura (Dimethyl) (POST)	4.46	4.72	4.59	48.63	48.84	48.74	80.67	80.99	80.83
T_{11}	2,4-D Ethylin ester (POST)	2.37	2.46	2.41	12.00	12.10	12.05	14.20	14.30	14.25
T_{12}	Isoproturon (POST)	6.03	5.71	5.87	56.62	56.77	56.69	71.07	71.10	71.08
S.E(m)		0.47	0.25	0.26	1.77	1.50	0.87	1.60	1.15	0.74
S.E(d)		0.66	0.35	0.37	2.51	2.12	1.23	2.26	1.63	1.04
C.D.		1.35	0.71	0.75	5.09	4.31	2.49	4.58	3.31	2.12

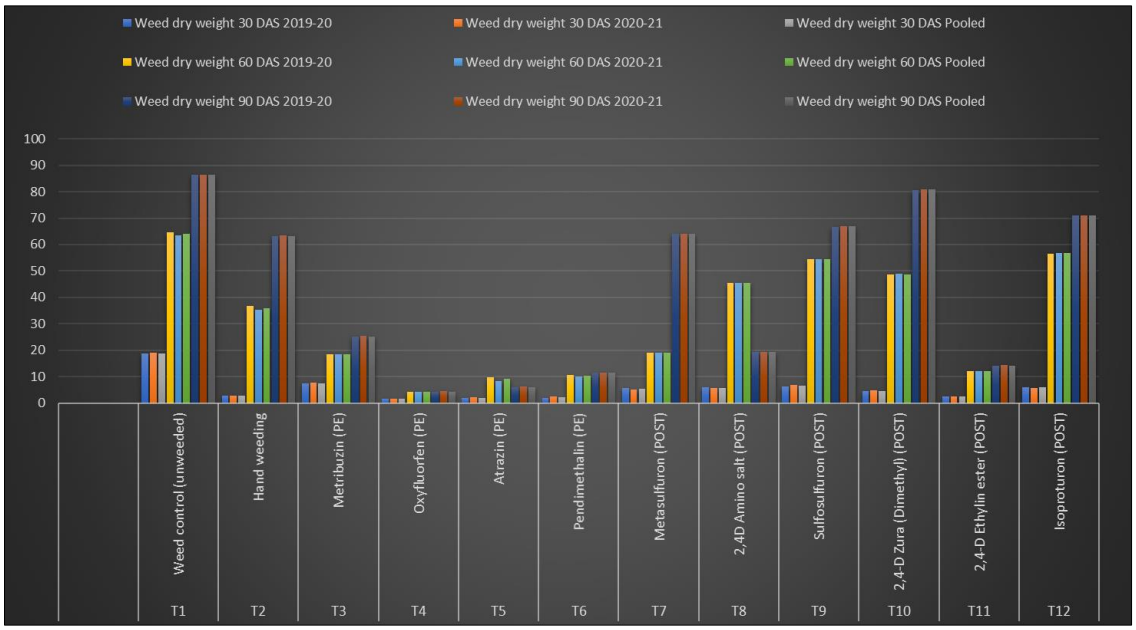

Fig 1: Impact of pre- and post-harvest weedicides on weed dry weight of wheat

Table 2: Impact of pre- and post-harvest weedicides on weed control efficiency of wheat

S.N.	Treatments	weed control efficiency								
		30 DAS			60 DAS			90 DAS		
		2019-20	2020-21	Pooled	2019-20	2020-21	Pooled	2019-20	2020-21	Pooled
T_1	Weed control (unweeded)	0	0	0	0	0	0	0	0	0
T_2	Hand weeding	85.24	85.37	85.28	43.23	44.18	43.7	26.73	26.71	26.72
T_3	Metribuzin (PE)	60.51	59.91	60.2	71.56	70.98	71.27	70.99	70.46	70.73
T_4	Oxyfluorfen (PE)	91.84	90.68	91.23	93.64	93.26	93.46	95.01	94.86	94.94
T_5	Atrazin (PE)	89.96	88.63	89.31	84.69	86.96	85.82	92.93	92.88	92.91
T_6	Pendimethalin (PE)	88.94	87.26	88.09	83.55	84.16	83.85	86.75	86.53	86.63
T_7	Metasulfuron (POST)	70.01	72.48	71.25	70.58	69.86	70.24	25.75	25.84	25.8
T_8	2,4D Amino salt (POST)	68.02	70.27	69.12	29.52	28.22	28.88	77.71	77.61	77.66
T_9	Sulfosulfuron (POST)	65.87	64.65	65.24	15.53	13.85	14.7	22.71	22.44	22.57
T_{10}	2,4-D Zura (Dimethyl) (POST)	76.07	75.17	75.61	24.67	22.95	23.81	6.52	6.3	6.41
T_{11}	2,4-D Ethylin ester (POST)	87.28	87.05	87.19	81.41	80.91	81.16	83.54	83.45	83.5
T_{12}	Isoproturon (POST)	67.65	69.96	68.8	12.29	10.44	11.39	17.64	17.74	17.7
S.E(m)		-	-	-	-	-	-	-	-	-
S.E(d)		-	-	-	-	-	-	-	-	-
C.D.		-	-	-	-	-	-	-	-	-

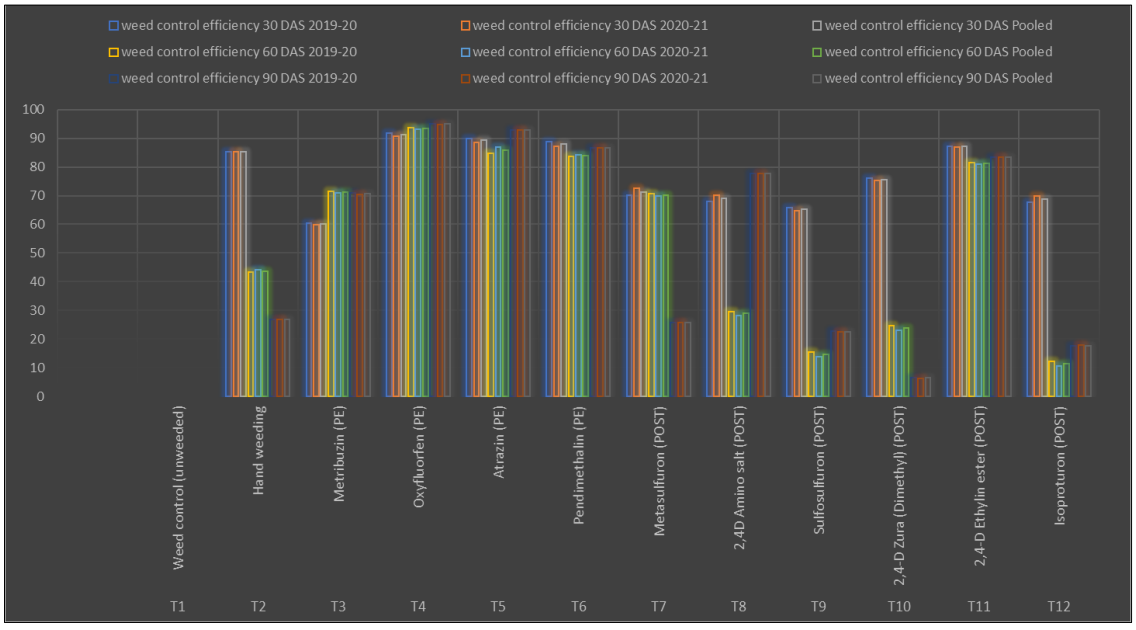

Fig 2: Impact of pre- and post-harvest weedicides on weed control efficiency of wheat

Conclusion

It is concluded that the field application of the preemergent herbicide Oxyfluorfen found superior at every stages of the crop growth and the performance is also satisfactory.

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