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Efficacy of dual herbicides on yield attributes, yield and economics of irrigated wheat

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ABSTRACT

In a winter 2021-22 field experiment at the Research Farm, College of Agriculture, Rewa (M.P.), the efficacy of dual herbicides on yield characteristics, yield, and economics of irrigated wheat was assessed. Treatment T6 (Clodinofop + Metsulfuron) came in second, followed by the weedy control, and finally, Treatment T7 (manual weeding) was shown to be the most effective technique of weed management. In terms of yield metrics like effective tiller density (521.66/m2), ear head length (6.91 cm), ear head grain density (58.82 grains/ear), and test weight, T7 (manual weeding) yielded the greatest results. The T6(Clodinofop+metsulfuron) treatment came in second, yielding up to 491.57 effective tillers per square meter, 6.80 centimeters in ear head length, 57.77 grains per ear head, and 58.23 grams in a test. Only in T8 were values below their respective controls. The grain yield was 5651 kg/ha and the straw output was 9384 kg/ha after T6 treatment raised the harvest index by up to 38.02%. The next treatment was T5, which utilized a combination of two herbicides. When compared to the other therapies, T8 yielded the weakest results. The post-emergence herbicidal treatment T6 (Clodinofop + Metsulfuron) had the highest benefit-to-cost ratio (2.98), resulting in the highest net revenue (in Indian Rupees). T3 followed Sulfosulfuron and Metsulfuron (T5). At a B:C ratio of 2.87 to 2.69, the yield per hectare is between $78.948 and $71.328. The minimal net returns and the B:C ratio were weeded out.

Key words: Dual herbicides, economics, irrigated wheat, yield

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INTRODUCTION

Today, wheat farmers can choose from a wide variety of effective herbicides for the control of broadleaf weeds and grasses. Persistent use of a single herbicide can lead to the development of resistance in weeds, as seen by the modest occurrence of isoproturon-resistant Phalar in rice-wheat rotation. The development of resistance to these herbicides could be slowed or avoided through the application of a herbicide cocktail (Dhawan et al, 2009). It has been shown that relying too heavily on herbicides with a single mode of action contributes to the growing difficulty of weed management.

Phalarisminor show resistance against isoproturon also weeds flora shifting shown by other weeds. For overcoming this problem clodinafop-propargyl + metsulfuron methyl (Vesta), sulfosulfuron and clodinafop are used in which vesta has proven excellent in control, herbicide and their combination (including those herbicide which are compatible to each other and not antagonatic) are very fruitful. Herbicide with different mode of action. Additive and synergic response of herbicide furnish broad-spectrum action, restrict weed shifting, prevent resistance, increasing efficacy of herbicide, lowdown selective coercion. The operation of herbicide mixture in now counter signed in all over the world as a part of pro-active herbicide resistance weed management program. For crop safety compatible mixture of herbicide is important also it delay evolution of resistance (Soni *et al* 2021). Weed and their interference is major discouragement of wheat production. Irrigation is supportive to wheat's uniform germination, and establishment but at the same time it supports weeds also. In such circumstances chemical weed control is better, cost effective and overcome the less feasibility of mechanical or manual weeding. Ready mix combinations are advantageous (Deshmukh*et al.* 2020). Therefore, keeping above facts in view, the present investigation was carried out to boost the productivity of wheat in this region.

MATERIALS AND METHODS

The experiment was carried out in the field at the College Farm of the College of Agriculture in Rewa (M.P.), during the winter of 2021-22. The soil in the test plot was sandy-loam with a pH of 7.2, accessible nitrogen of 183 kg/ha, phosphorus of 18 kg/ha, potassium of 297 kg/ha, organic carbon of 0.48%, and electrical conductivity of 0.29 dS/m. The study was set up in a randomized block design with three independent runs. There were eight herbicide treatments in

each replication. Clodinofop-propagyl, Metsulfuron-methyl, and pendimethalin were used singly or in combination, including hand weeding and weedy check, for a total of eight treatments.

Notation	**Treatments**	Rateofapplication (kga.i.ha-1)	Timeofapplication
T_1	Pendimethalin	1	Pre-emergence
T_2	Metsulfuron	0.04	Post-emergence
T_3	Sulfosulfuron	0.025	Post-emergence
T_4	Clodinofoppropargyl	0.06	Post-emergence
T5	Sulfosulfuron + Metsulfuronmethyl	0.03+0.002	Post-emergence
T6	Clodinofoppropargyl +Metsulfuron methyl	0.06+0.004	Post-emergence
T7	Hand weeding (once)	1	30DAS
T8	Weedycheck(control)		

Wheat of the GW-322 variety was planted with a seeding rate of 100 kg/ha and a row spacing of 22.5 cm on December 3, 2021. In all cases, the suggested amount of fertilizer (120:60:40 kg NPK/ha) was used. The planting was carried out using the advised set of techniques. On April 8, 2022, we picked the produce.

RESULTS AND DISCUSSION

Yield attributes and yield of wheat: It was clear from the outcomes that the various weed management strategies had a major impact on the wheat yield parameters. T7 (Handweeding) produced the highest yields across the board, with an average of 521.66 effective tillers per square meter, 6.91 centimeters in ear head length, and 58.82 grains per ear head and a test weight of 38.96 grams.Post-emergenceT7 (Clodinofop+ Metsulfuron) was then compared to the other weed-control treatments and the weedy control and was shown to be considerably more effective. The lowest levels were observed in treatment T8 (weedy check), however.Further analysis revealed that the various herbicidal weed management strategies significantly impacted sofwheat's production parameter.When compared to the other weed-control treatments and the weedy control, T6, which used the identical dual herbicides, performed much better. Harvest index reached 38.02 percent,

with grain yielding 5651 kilograms per hectare and straw yielding 9384 kilograms per hectare. Then came the T5 treatment, which included two separate herbicides. Treatment T8 (weedycheck) had the lowest values of any of the treatments (table1).

Weeds typically lower crop productivity by limiting the development and other productive capacities of crop plants. All weed control treatments in this study increased grain and straw output and harvest index significantly when compared to weedy check, but they did so in different ways depending on the scope of their weed control and the efficacy of the dual herbicides utilized (Table-2). The lower revival frequency and weed development in these plots, as measured by weed dry matter, may explain why their yield attributes are more clearly shown. This gave crop plants an upper hand in the nutrient race against weeds. The results are in agreement with those found by Kumar et al. (2012), Tomar & Tomar (2007), and others (2014). Pal et al. (2012), Kumar et al. (2018), Jaiswal et al. (2020), and Deshmukh et al. (2020) are just a few of the organizations that have made this claim.

Economical gain from wheat :

The data appeared to show that the economic advantage from wheat varied significantly among the various herbicidal weed management techniques.When compared to the other weed control treatments and the weedy control, T6 (Clodinofop + Metsulfuron) was determined to be the most beneficial. With a B:C of 2.98, the net income reached as high as Rs. The net income ranged from Rs.78948 to Rs.71328/ha with T5 (Sulfosulfuron+Metsulfuron) and then from Rs.78948 to Rs.71328/ha with T3 (Sulfosulfuron), with a B:C ratio of 2.87 to 2.69. Weedy check included noting the minimal net returns and B:C.T6 and T5 treatments with dual herbicides may have led to higher nutrient concentration (uptake) in the crop because of the relatively weed-free environment. since of this, more grain was produced from the same amount of sunlight exposure since both broadleaf and grassland weeds were kept under control. As a result, wheat crops treated with T6 and T5 produced more biomass, increasing their gross income.Chopra and Chopra's findings don't jibe with Tomar and Tomar's (2014), Kumar *et.al*(2018), and Meena *et al*(2019).

CONCLUSION

The following conclusions can be reached based on the aforementioned data and discussion:Medicago hispida (29.28%), Avena ludoviciana (26.66%), Anagallisarvensis (19.98%) were predominant weeds in wheat, however other weeds like Phalaris minor Chenopodium album(17.5%) and Phalaris minor (6.52%) were also found associated with wheat.Hand weeding was best treatment but its cost of cultivation was very highcompared to other treatments and thise treatment was followed by T6 (Clodinofop + Metsulfuron) and Post-emergence application of T6(Clodinofop + Metsulfuron) 0.06+0.004 kg a.i./ha was second best treatment found most suitable for effective control of weeds in wheat.

Conflict of interest: On behalf of all authors, the corresponding author states that there is no conflict of interest.

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Table1: Effective tillers and Non effective tillers/m^2,Weed index(%),Harvest index(%)of wheat as influenced by herbicidal weed management

Treatments		Effective tillers/m^2	Non effective tillers/m^2	Length of earhead (cm)	Number of grains/ear	Test Weight(g)
T1	Pendimethalin@1.0 a.i.ha^{-1}	351.46	17.45	5.93	44.23	37.08
T2	Metsulfuron @0.04a.i.ha^{-1}	389.43	14.55	6.28	52.69	37.31
T3	Sulfosulfuron @0.025 a.i.ha^{-1}	408.65	15.36	6.46	53.83	37.52
T4	Clodinofoppropargyl@ 0.06 a.i.ha^{-1}	368.34	16.46	6.14	49.94	37.15
T5	Sulfosulfuron + Metsulfuron methyl @0.03+0.002a.iha^{-1}	429.43	11.91	6.72	56.59	37.89
T6	Clodinofoppropargyl +Metsulfuron methyl@0.06+0.004a.i.ha^{-1}	491.57	8.69	6.80	57.77	38.51
T7	Hand weeding (once)	521.66	5.52	6.91	58.82	38.96
T8	Weedycheck(control)	277.11	21.66	5.25	34.26	36.92
S.EM□		1.12	0.20	0.16	0.32	0.20
C.D.(P=0.05)		3.27	0.59	0.46	0.94	0.60

Table2 :Productivity parameters grain yield,straw yield, cost of cultivation,gross return,net returns andB:C ratioof wheat crop as influenced by herbicidal weed management

Treatments		Grain yield (kg/ha)	Straw yield (kg/ha)	Cost of cultivation (Rs/ha)	Gross return(Rs/ ha)	Net returns (Rs/ha)	B:C ratio
T1	Pendimethalin@ 1.0 a.i.ha^{-1}	3869	8072	42040	86032	43992	2.04
T2	Metsulfuron@0.04a.i. ha^{-1}	4883	8746	41640	107138	65498	2.57
T3	Sulfosulfuron@ 0.025 a.i.ha^{-1}	5179	8942	41970	113298	71328	2.69
T4	Clodinofoppropargyl @ 0.06 a.i.ha^{-1}	4539	8329	41759	99789	58030	2.38
T5	Sulfosulfuron+Metsulfu ron methyl @0.03+0.002a.iha^{1}	5554	9120	42085	121033	78948	2.87
T6	Clodinofoppropargyl+ Metsulfuron methyl @0.06 +0.004a.i.ha^{-1}	5651	9384	41985	125266	83281	2.98
T7	Hand weeding (once)	5876	9518	49640	127919	78279	2.57
T8	Weedycheck(control)	2475	5557	40890	55428	14538	1.35
S.EM□		198.91	81.70				
C.D.(P=0.05)		581.93	239.01				