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## Effect of chemical weedicide on wheat yield attributes and grain yield

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### Abstract

The experiment aimed to study the effects of different weed control treatments on wheat yield attributes during Rabi 2020-21. Three different treatments of weed control were used in the experiment. They were Weedy Check (treatment involved leaving the crop without any weed control measures allowing the weeds to grow naturally); second treatment involved the application of a weedicide mixture containing Clodinofof and Metsulfuron) at 35 days after sowing.; and third treatment involved the application of a mixture of weedicides, namely Isoproturon and 2, 4-D at 35 days after sowing. The results of the experiment indicated that the application of the weedicide mixtures Clodinofof + Metsulfuron and Isoproturon + 2, 4-D resulted in higher yield attributes and grain yield when compared to the weedy check. (Without weed control). The highest recorded grain yield was 5038 kg ha<sup>-1</sup> in the Clodinofof + Metsulfuron (RM) treatment. Additionally, the straw yield was recorded as 7563 kg ha<sup>-1</sup>, and the biological yield was 12602 kg ha<sup>-1</sup> in the same treatment. These results suggest that the use of Clodinofof + Metsulfuron weedicide mixture was effective in controlling weeds and significantly improved crop productivity compared to the untreated weedy.

**Keywords:** Chemical, weedicide, grain

### Introduction

It is evident that wheat plays a crucial role in India's food chain, following rice, and significantly contributes to the country's food security. Over the years, India has made remarkable progress in increasing wheat production and sustainability. In 2022, the total wheat grain production in India was 106.84 million metric tons from an area of 30.47 million hectares, with a yield level of 3507 kg per hectare.

Rajasthan, a state in India, accounted for about 8.47 percent of the national wheat cultivation area and 8.88 percent of the total wheat production. The average productivity of wheat in Rajasthan during the same period was 3676 kg per hectare (Govt. of India, 2022 <sup>[3]</sup>). However, one of the significant challenges faced in wheat cultivation is weed interference. Weeds compete with the wheat crop for essential resources such as nutrients, moisture, light, and space (Chhokar *et. al.*, 2012) <sup>[1]</sup>, leading to reduced yields and overall productivity. The most common types of weed infestations in wheat are grassy and broad-leaved weeds. The control of these weeds needs a variety of weedicides (Sharma *et. al.*, 2015) <sup>[7]</sup>. To combat these weed problems, farmers need to use a variety of weedicides. Weedicides are chemicals designed to control or eliminate weeds from agricultural fields, thereby reducing their negative impact on crop growth and yield.

Das and Yaduraju (2012) <sup>[2]</sup> suggested that using a broad spectrum herbicide mixture can be more effective than using a single herbicide and that continuous use of a single herbicide should be avoided to prevent herbicide resistance.

The present study aimed to evaluate whether using a mixture of compatible weedicides could enhance weed control, improve wheat yield attributes (such as height, tiller number, etc.), and ultimately increase the grain yield. By using a combination of different weedicides, they could have tried to target a wider range of weed species and reduce the likelihood of herbicide-resistant weeds developing.

### Materials and Methods

The On Farm Testing was conducted at Jhadol block of Udaipur district of Rajasthan during Rabi 2020-21 seasons. The experiment evaluated three weed control methods [weedy check, Clodinofof + metsulfuron (RM) and isoproturon + 2, 4-D (TM)] at 35 DAS using the

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wheat variety 'Raj-4079.' The soil texture in the area was clay-loam, and the nutrient availability was medium in available nitrogen (315.25 kg ha<sup>-1</sup>), medium in phosphorus (32.50 kg ha<sup>-1</sup>) and high in potassium (430.40 kg ha<sup>-1</sup>).

The wheat crop received the recommended dose of fertilizers, which includes 120 kg N (Nitrogen), 60 kg P<sub>2</sub>O<sub>5</sub> (Phosphorous), and 40 kg K<sub>2</sub>O (Potash) per hectare. These nutrients were applied using Diammonium phosphate and urea.

The full dose of Phosphorous and Potash was applied at the time of sowing. However, for Nitrogen, only half of the recommended dose was applied at sowing. The remaining Nitrogen was applied in two equal quantities during the first and second irrigation.

Plant height was recorded at three different stages of growth: 60 days after sowing (DAS), 90 DAS, and at the time of harvesting. The height of five randomly selected plants from each experimental plot was measured and expressed as "number m-2," which means the number of plants per square meter. Dry matter accumulation was recorded at the same three stages of growth (60 DAS, 90 DAS, and harvesting). The dry matter accumulation was measured as "g m-2," which means the amount of dry matter (in grams) per square meter. The yield of wheat from each experimental plot was also noted.

## Results and Discussion

### Effect on plant height

**Weed control:** Two different herbicide combinations, Clodinafop + metsulfuron (RM) and Isoproturon + 2, 4-D (TM), were applied to wheat crops. These herbicide combinations resulted in higher plant height compared to the control (weedy check) at three different time times: 60 days after sowing (DAS), 90 DAS, and at harvest. Table 1 presents the data showing the plant height recorded for each treatment at 60 DAS, 90 DAS, and harvest.

The availability of metabolites and the capacity of storage organs play a crucial role in regulating the complex process of yield formation in crops (Watson, 1971) [5]. Metabolites are the intermediate products and end-products of various metabolic pathways in plants. They include substances like sugars, amino acids, organic acids, hormones, and other

biochemical compounds. These metabolites are essential for various physiological processes in plants, including photosynthesis, respiration, and nutrient transport.

### Effect on dry matter accumulation

**Weed control:** In a Rabi season, weed control treatments positively impacted dry matter accumulation compared to the weedy check. Dry matter accumulation was recorded at three different stages of growth: 60 days after sowing (DAS), 90 DAS, and at harvest. Highest dry matter accumulation found with the application of Clodinafop + metsulfuron (RM) at 60 DAS, 90 DAS and at harvest were 340.07, 651.74 and 1126.20 g m<sup>-2</sup> respectively. The same results were also reported by Meena (2015) [6].

According to the data and the reference, it is clear that weed control treatments, particularly the effect of Clodinafop + metsulfuron (RM), significantly increased the dry matter accumulation in the wheat crop compared to the weedy check during the Rabi season. The dry matter accumulation was recorded at three different time points: 60 days after sowing (DAS), 90 DAS, and at harvest. The data showed that dry matter at 60 DAS, 90 DAS and at harvest were 340.07, 651.74 and 1126.20 g m<sup>-2</sup> respectively. The same results were also reported by Meena (2015) [6].

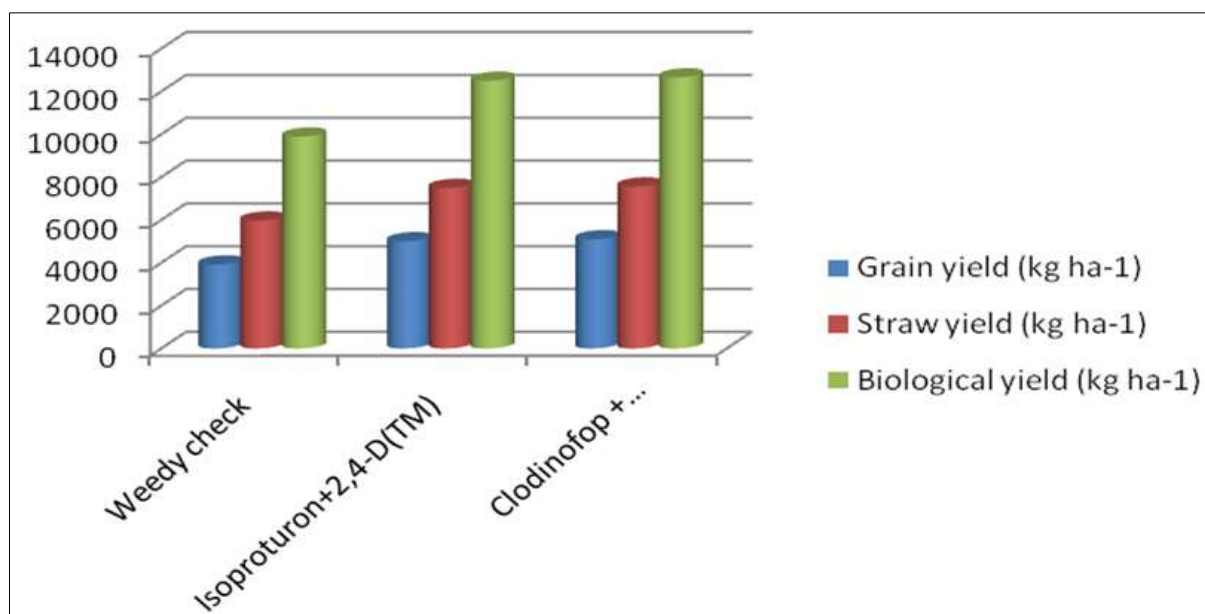
Overall, the data and reference suggest that the application of Clodinafop + metsulfuron (RM) as a weed control treatment positive effect on the dry matter accumulation of wheat crops during the Rabi season. This increased dry matter accumulation is likely one of the contributing factors to the higher plant height and potentially higher yields observed in the treated plots compared to the weedy check.

### Effect on yield

**Weed control:** In reference to data showed that both weed control treatments were obtained maximum yield of wheat in comparison to weedy check plot. From the weed control treatments, maximum yield was recorded in the plot under Clodinafop + metsulfuron (RM) but similar result with isoproturon + 2, 4-D (TM). The highest harvest index recorded under application of Clodinafop + metsulfuron (RM) 40.23 per cent. Idanani and Kumar (2012) [4] and Meena (2015) [6] also reported same results for wheat.

**Table 1:** Effect of weed control on yield attributes and yield of wheat crop

Treatments	Plant height (cm)			Crop dry matter accumulation (g m <sup>-2</sup> )			Grain yield (kg ha <sup>-1</sup> )	Straw yield (kg ha <sup>-1</sup> )	Biological yield (kg ha <sup>-1</sup> )	Harvest index (%)
	At 60 DAS	At 90 DAS	At harvest	At 60DAS	At 90DAS	At harvest				
<b>Weed control</b>										
Weedy check	35.50	81.30	83.15	285.52	577.85	1008.16	3919	5973	9893	39.76
Isoproturon+2,4-D (TM)	37.21	84.62	87.31	333.03	630.23	1121.16	5004	7496	12500	40.03
Clodinafop + metsulfuron (RM)	37.99	84.69	87.58	340.07	651.74	1126.20	5095	7563	12658	40.25



**Fig 1:** Effect of weed control on yield of wheat crop

### Conclusion

Application of chemical weedicide in wheat crops have positive effect on wheat yield attributes and grain yield in comparison to weedy check. The cost involve in the application of weedicide is much lesser than the benefits occurred.

### Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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