

Growth and Yield Performance of Wheat under Eucalyptus Tereticornis based Agroforestry System

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Abstract -A field experiment was conducted to find out the growth and yield performance of wheat (*Triticum aestivum* L.) crop with weed control treatments under eucalyptus based agroforestry system. An experiment was conducted at the farmer field village- Majitha, District- Jabalpur during the rabi season of 2016-17. Treatments consisted of 10 weed control treatments [2, 4-D 0.5 lit ha⁻¹, Metribuzin 0.250 Kg ha⁻¹, Butachlor 1 lit ha⁻¹, Clodinafop-propargyl 0.140 kg ha⁻¹, 2, 4-D 0.5 lit ha⁻¹ fb metribuzin 0.250 Kg ha⁻¹, 2, 4-D 0.5 lit ha⁻¹ fb Butachlor 1 lit ha⁻¹, Metribuzin 0.250 Kg ha⁻¹ fb butachlor 1 lit ha⁻¹, 2, 4-D 0.5 lit ha⁻¹ + hand weeding 30 DAS, Hand weeding 30 DAS and weedy check] laid out in randomized block design with three replication. The result revealed that maximum plant height at harvest (71.77 cm), number of effective tillers per meter row length (74.67), length of ear head (7.10 cm), 1000 grain weight (31.33 gm), grain yield (19.75 q ha⁻¹), straw yield (46.54 q ha⁻¹) and harvest index (29.80 %) was recorded under hand weeding 30 DAS. Whereas, lowest plant height (64.67 cm), number of effective tillers per meter row length (58.33), length of ear head (4.47 cm), 1000 grain weight (22.60 gm), grain yield (13.07 q ha⁻¹), straw yield (34.99 q ha⁻¹) and harvest index (27.23%) were recorded under weedy check. Amongst chemical weed control treatments, the clodinafop-propargyl 0.140 kg ha⁻¹ recorded higher plant height (70.17 cm), number of effective tillers per meter row length (70.33), length of ear head (6.17 cm), 1000 grain weight (28.33 gm), grain yield (17.63 q ha⁻¹), straw yield (41.36 q ha⁻¹) and harvest index (29.89%) followed by 2, 4-D 0.5 lit ha⁻¹ + hand weeding 30 DAS, metribuzin 0.250 Kg ha⁻¹ and 2, 4-D 0.5 lit ha⁻¹ under eucalyptus based agroforestry system.

Key word: *Eucalyptus tereticornis*, Wheat, Growth, Grain yield, Harvest index, Agroforestry.

I. INTRODUCTION

Agroforestry is one of the best option to increase the tree cover outside the forest. The need of agroforestry has been necessitated in many parts of the country, which face several agricultural and ecological problems, predominant of which are soil degradation, large scale deforestation, increasing population pressure of human beings and livestock, and decreasing land:man ratio. Intercropping, especially during the tree gestation period, could be economically profitable and is environmentally sound indeed. Trees on farm can be made popular, especially fast growing like eucalypts which also provide fodder, fuel and

timber. Thus keeping in view multipurpose uses and role in bio-drainage eucalypts plantation is likely to be adopted on large scale on government and private lands. (Kumar et al., 2013)

Wheat (*Triticum aestivum* L.) is widely intercropped cereal crop during rabi season (November-April) with Eucalyptus, Poplar, and other fast growing tree species in Northern states of India viz., Uttarakhand, Punjab, Haryana, Uttar Pradesh and Bihar, parts of Central and Eastern states such as Madhya Pradesh, Chhattisgarh and West Bengal. Eucalyptus is the most successful fast growing, industrial agroforestry tree species in India with extremely high productivity up to 10-30 m³ha⁻¹yr⁻¹. Intercropping with high density short rotation tree species is the best option to meet the increasing food and industrial raw material requirement through sustainable utilization of natural resources (Sarvade et al., 2014).

Ecologically, wheat is adapted to a variety of climates and stressed environments including salinity. However, different biotic and abiotic stresses cause reduction in grain yield to various extents depending upon their nature and intensity. In agroforestry systems, reduction in yield of wheat is generally observed under the shade of tree crown and weeds due to resource competition (Puri and Bangarwa, 1992 and Awan et al., 2015). Therefore, the present study was conducted to assess the growth and yield performance of wheat with weed management practices under eucalypts based agroforestry system.

II. PREVIOUS WORK

Pisal and Sagarka (2013) reported that weed free treatment recorded significant improvement in yield attributes, viz. number of effective tillers, spikelets per spike and grain weight per plant, followed by pendimethalin 0.9 kg/ha as pre-emergence followed by one hand weeding at 35- 40 DAS. All the weed control treatments significantly influenced the grain and straw yield of wheat excluding unweeded control.

Kumar et al., (2013) reported that the height of wheat and mustard was significantly less under agri-silviculture system as compared to sole cropping. The other parameters

such as plants per running meter row length (161.7), spike length (7.7 cm), grains per spike (37.7) and test weight (26.7g) were significantly less under Eucalyptus than in sole cropping. The grain and straw/stover yields of both the crops under Eucalyptus decreased significantly as compared to sole cropping. Grain yield reduction (63.2%) was less in wheat.

Amare et al., (2014) reported that Highest grain yield (2289.4 kg ha⁻¹) was recorded in hand weeding followed by post emergent isoproturon at 1.5 kg ha⁻¹ (2177.3 kg ha⁻¹). The highest straw yield was recorded in hand weeding followed by isoproturon 1.50 kg ha⁻¹, and harvest index was also maximum with hand weeding.

Yadav et al. (2016) reported that the the tank-mix application of metribuzin with clodinafop 60 g ha⁻¹ or sulfosulfuron 25 g ha⁻¹ at 35 DAS and the sequential application of pendimethalin 1000 g ha⁻¹ or trifluralin 1000 g ha⁻¹ just after sowing followed by clodinafop 60 g ha⁻¹ or sulfosulfuron 25 g ha⁻¹ at 35 DAS provided 90-100% control of P. minor along with broadleaf weeds in wheat, thus resulting in improved grain yields (4.72-5.75 t ha⁻¹) when compared to clodinafop 60 g ha⁻¹ (3.85-5.60 t ha⁻¹) or sulfosulfuron 25 g ha⁻¹ alone (3.95-5.10 t ha⁻¹).

III. MATERIAL AND METHODS

The field experiment was conducted at farmer's field at Village - Majitha, Block - Shahpura, District - Jabalpur during Rabi season 2016 -17. The experiment was laid out in randomized block design with three replications and consisted of ten weed control treatment [2, 4-D 0.5 lit ha⁻¹, Metribuzin 0.250 Kg ha⁻¹, Butachlor 1 lit ha⁻¹, Clodinafop-propargyl 0.140 kg ha⁻¹, 2, 4-D 0.5 lit ha⁻¹ fb metribuzin 0.250 Kg ha⁻¹, 2, 4-D 0.5 lit ha⁻¹ fb Butachlor 1 lit ha⁻¹, Metribuzin 0.250 Kg ha⁻¹ fb butachlor 1 lit ha⁻¹, 2, 4-D 0.5 lit ha⁻¹ + hand weeding 30 DAS, Hand weeding 30 DAS and Weedy check]. Wheat variety LOK-1 was sown with 25 cm row spacing at a depth of 4 cm from the top of the soil by opening furrows through a Kudal. The observations on crop growth, yield attributes and yield were recorded in all the treatments at the time of harvest. Harvest index was calculated as the ratio of grain yield to the biological yield. All the experimental data were statistically analyzed and critical difference (CD) was worked out by the procedure as described by Gomez and Gomez (1984).

IV. RESULT AND DISCUSSION

Growth Parameter

The result indicated that growth parameters such as plant height and number of tillers/MRL of wheat crop were significantly influenced by weed control treatments. Maximum plant height and number of tillers per meter row length was recorded in hand weeding 30 DAS (71.77 cm and 78.00) as compared to all other treatments and weedy check which was recorded significantly lower plant height

and number of tillers per meter row length (64.67 cm and 66.33) at par with butachlor 1 lit ha⁻¹ (65.33 cm and 70.00) in all the treatment (Table 1). Among the chemical weed control treatment clodinafop-propargyl 0.140 kg ha⁻¹ recorded higher plant height and number of tillers per meter row length (70.17 cm and 75.00) followed by 2, 4-D 0.5 lit ha⁻¹ + hand weeding 30 DAS (70.03 cm and 74.51), metribuzin 0.250 Kg ha⁻¹ (69.87 cm and 74.17), 2, 4-D 0.5 lit ha⁻¹ (69.33cm and 73.67), 2, 4-D 0.5 lit ha⁻¹ fb metribuzin 0.250 Kg ha⁻¹ (69.00 cm and 73.20). The reason for higher values of growth parameter in hand weeding can be discussed in the light of fact that crop under eucalyptus plantation with these treatments had comparatively less weed competition for nutrient, moisture, space, light and thereby more availability of these resources than other treatments which resulted in better crop growth. (Varma et al., 2013)

Yield and yield attributes,

The result showed that maximum number of effective tillers per meter row length, length of ear head and 1000 grain weight was found under hand weeding 30 DAS (74.67, 7.10 cm and 31.33 gm) as compared to all other treatments and weedy check. Among the herbicidal treatments, clodinafop-propargyl 0.140 kg ha⁻¹ (70.33, 6.17 cm and 28.33 gm) recorded maximum number of effective tillers per meter row length, length of ear head and 1000 grain weight followed by 2, 4-D 0.5 lit ha⁻¹ + Hand weeding 30 DAS (70.00, 6.00 cm and 27.67 gm), metribuzin 0.250 Kg ha⁻¹ (69.33, 5.87 cm and 27.50 gm), 2, 4-D 0.5 l ha⁻¹ (68.67, 5.67 cm and 26.83 gm), 2, 4-D 0.5 l ha⁻¹ fb metribuzin 0.250 Kg ha⁻¹ (69.00, 5.58 cm and 26.50 gm) respectively. The weedy check recorded significantly lower number of effective tillers per meter row length, length of ear head and 1000 grain weight (58.33, 4.47 cm and 22.60 gm) respectively, under wheat-Eucalyptus tereticornis based Agroforestry System (Table No 1).

The grain yield and straw yield of wheat was found significantly superior in hand weeding- 30 DAS (19.75 qha⁻¹ and 46.54 qha⁻¹) over weedy check (13.07 qha⁻¹ and 34.99 qha⁻¹). Among the herbicidal treatments clodinafop-propargyl 0.140 kg ha⁻¹ (17.63 qha⁻¹ and 41.36 q ha⁻¹) followed by 2, 4-D 0.5 lit ha⁻¹ + hand weeding 30 DAS (17.19 q ha⁻¹ and 40.22 q ha⁻¹), metribuzin 0.250 Kg ha⁻¹ (17.04 q ha⁻¹ and 40.10 q ha⁻¹) and 2, 4-D 0.5 lit ha⁻¹ (16.67 q ha⁻¹ and 39.92 q ha⁻¹) over weedy check followed by butachlor 1 lit ha⁻¹ (13.97 and 35.41 q ha⁻¹) respectively. The higher harvest index was found under 2, 4-D 0.5 lit ha⁻¹ + hand weeding 30 DAS (29.95%) over weedy check (27.23%) and at par with all other weed control treatments. The yield reduction in weedy check plot over hand weeding is 33.82% under wheat-Eucalyptus tereticornis based agroforestry system (Table 2).

Table 1: Growth and Yield attributing character of wheat as influenced by different treatments under Agroforestry system.

Treatment		Growth and yield attributes of wheat				
		Plant height At Harvest	No of tillers / MRL	No of effective tillers/ MRL	Length of ear head (cm)	1000 grain weight (g)
T ₁	2, 4-D 0.5 lit ha ⁻¹	69.33	73.67	68.67	5.67	26.83
T ₂	Metribuzin 0.250 Kg ha ⁻¹	69.87	74.17	69.33	5.87	27.50
T ₃	Butachlore 1 lit ha ⁻¹	65.33	70.00	67.33	4.93	23.82
T ₄	Chlodinofof-properzyle 0.140 kg ha ⁻¹	70.17	75.00	70.33	6.17	28.33
T ₅	2, 4-D 0.5 lit ha ⁻¹ fb metribuzin 0.250 Kg ha ⁻¹	69.00	73.20	69.00	5.58	26.50
T ₆	2, 4-D 0.5 lit ha ⁻¹ fb butachlor 1 lit ha ⁻¹	67.67	72.67	64.00	5.23	25.17
T ₇	Metribuzin 0.250 Kg ha ⁻¹ fb butachlor 1 litha ⁻¹	66.67	71.33	62.67	5.13	24.33
T ₈	2, 4-D 0.5 lit ha ⁻¹ + hand weeding 30 DAS	70.03	74.51	70.00	6.00	27.67
T ₉	Hand Weeding 30 DAS	71.77	78.00	74.67	7.10	31.33
T ₁₀	Weedy check	64.67	66.33	58.33	4.47	22.60
SEm±		0.53	0.64	0.81	0.14	0.91
CD (P=0.05)		1.54	1.87	2.36	0.41	2.66

Table 2: Grain yield, straw yield and harvest index of wheat as influenced by different treatments under Agroforestry system.

Treatment		Grain Yield (q ha ⁻¹)	Straw Yield (q ha ⁻¹)	Harvest Index (%)
T ₁	2, 4-D 0.5 lit ha ⁻¹	16.67	39.92	29.45
T ₂	Metribuzin 0.250 Kg ha ⁻¹	17.04	40.10	29.83
T ₃	Butachlore 1 lit ha ⁻¹	13.97	35.41	28.27
T ₄	Chlodinofof-properzyle 0.140 kg ha ⁻¹	17.63	41.36	29.89
T ₅	2, 4-D 0.5 lit ha ⁻¹ fb metribuzin 0.250 Kg ha ⁻¹	15.84	38.82	28.97
T ₆	2, 4-D 0.5 lit ha ⁻¹ fb butachlor 1 lit ha ⁻¹	15.27	37.67	28.84
T ₇	Metribuzin 0.250 Kg ha ⁻¹ fb butachlor 1 litha ⁻¹	15.00	36.50	29.14
T ₈	2, 4-D 0.5 lit ha ⁻¹ + hand weeding 30 DAS	17.19	40.22	29.95
T ₉	Hand Weeding 30 DAS	19.75	46.54	29.80
T ₁₀	Weedy check	13.07	34.99	27.23
SEm±		0.40	0.82	0.71
CD (P=0.05)		1.17	2.39	2.08

V. CONCLUSION

The experiment concluded that the Growth and yield parameters of wheat were lower in weedy check plot. Whereas, hand weeding under eucalyptus plantation provide higher Growth and yield of wheat crop than the other weed management practices. Among different herbicidal treatments clodinafof-propargyl 0.140 kg ha⁻¹ is provide maximum Growth and yield followed by 2, 4-D 0.5 lit ha⁻¹ + hand weeding 30 DAS, metribuzin 0.250 Kg ha⁻¹, 2, 4-D 0.5 lit ha⁻¹ under wheat - *Eucalyptus tereticornis* based agroforestry system. The 33.82% yield

are increase under hand weeding 30 DAS than weedy check under wheat - *Eucalyptus tereticornis* based agroforestry system.

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