International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(3): 2528-2534

Received: 23-03-2018
Accepted: 24-04-2018

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Effect of weed management on growth and yield performance of wheat under *Eucalyptus tereticornis* based agroforestry system

Atul Singh, KK Jain, SD Upadhyaya, AK Dwivedi and HL Sharma

Abstract
A field experiment was conducted during winter season 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 and 2017-18. The field was infested with 5 major weed species *Phalaris minor*, *Rumex dentatus* (L.), *Meliotus indica* (L.), *Chenopodium album* (L.) *and Launaea nudicaulis* (L.). Minimum weed density per m^2, weed dry weight (4.17 and 1.57 q ha^{-1}) and NPK uptake (1.77, 0.23 and 2.73 kg ha^{-1}) was found under hand weeding 30 DAS over weedy check. The maximum weed control efficiency, grain yield, straw yield and harvest index was recorded under hand weeding 30 DAS (91.12%, 18.97 q ha^{-1}, 43.13 q ha^{-1} and 30.61%). Maximum nutrient uptake was also recorded in these treatments. Post emergence herbicides and /or hand weeding can further enhance the weed suppressive effect of the crop under *Eucalyptus tereticornis* based agroforestry system.

Keywords: Weed management, grain yield, straw yield, nutrient uptake, agroforestry

Introduction
Agroforestry may be one of the solution to increase area out side the forest to one third of the total geographical area of our country. The current forest area of the country (70.1 million ha. 21.34%) is not in a position to meet out the current demand of fuel, fodder, timber, raw material for small and large scale industry and forest products (Forest survey of India, 2015) [6]. The importance of agroforestry land use for food, fuel, fodder, fruits, fertilizer, timber, etc. and also in conservation of natural resources have been well recognized. The agrisilviculture (tree+crop) system is more productive and sustainable than agriculture. India is the first country in the world to adopt the National Agroforestry Policy in 2014, under its Ministry of Agriculture and Farmers Welfare. It objective is to expand tree plantation in combination with crops and/or livestock to improve overall productivity, reducing unemployment, generating additional source of income and livelihood support to small landholders. (Verma *et al*., 2017) [21].

Wheat (*Triticum aestivum* L.) is the major cereal crop in many dry areas of the world and a basic food for more than one third of the world population. It is a prime source of carbohydrates and protein which has served as a staple diet for mankind (Nural-lslam and Johanson, 1987) [15]. 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) [16, 3].

Weed infestation is one of the major factor limiting crop productivity. For realizing full genetic yield potential of the crop, the proper weed control is one of the essential management practices. Weeds not only reduce the yield but also make the harvesting operation difficult. Therefore, for sustaining food grain production to feed ever-increasing population and ensuring food security, effective weed management is very essential. Uncontrolled weeds are reported to cause upto 66% reduction in wheat grain yield (Angiras *et al*., 2008, Kumar *et al*., 2010 and Kumar *et al*., 2011) [2, 10, 11, 12] or even more depending upon the weed density, type of weed flora and duration of infestation. In wheat growing bowl of the country, infestation of grassy weeds likes *P. minor* and *Avena ludoviciana* L. and broadleaf weeds like *Chenopodium*

album L., *Chichorium intybus* L. and *Rumex dentates* L. etc are increasing at an alarming rate thus culminating wheat yield reduction by 18 to 73%. (Dixit and Singh, 2008) [5]. Hence, an experiment was conducted to evaluate the effect of weed control treatments, herbicides and their mixtures on weeds and wheat yield under *Eucalyptus tereticornis* based agroforestry system.

Material and Methods

The field experiment was conducted at farmer's field at Village - Majitha, Block – Shahpura, District - Jabalpur during Rabi season 2016 -17 and 2017-18 during the growing season of crop. 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 weed control treatments and herbicides were applied as post emergent at crop tillering stage i.e. about 30 DAS. Weed population was counted with the help of quadrate (0.25cm X 0.25cm) thrown randomly at four places in each plot and converted in to m^2 area. The aboveground weed dry matter was also recorded from the above thrown quadrates after cutting weeds from the ground level and then oven dried at 70^0C and converted to m^2. 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. It was calculated as per the formula proposed by Nichiporovich (1967) [14].

$$\text{Harvest Index} = \frac{\text{Economic yield}}{\text{Biological yield}} \times 100$$

Weed control efficiency (WCE)

Weed control efficiency (WCE) of the treatments against weedy check was calculated on the basis of weed dry weight as suggested by Mani *et al*. (1973) [13].

$$\textbf{WCE (\%)} = \frac{WD_c - WD_t}{WD_c} \times 100$$

Where, WCE = Weed control efficiency
WD_c = Dry weight of weeds in unweeded control plot
WD_t = Dry weight of weeds in treated plot

The nitrogen uptake (kg ha^{-1}) was computed by multiplying per cent nitrogen in plant sample with dry matter obtained per hectare at maturity divided by 100. The nitrogen content in the plant sample was estimated by the modified Micro kjeldahl method (Jackson, 1973) [7].

$$\text{N uptake (kg ha}^{-1}) = \frac{\text{N conc. (\%) x Wt. of dry matter (kg ha}^{-1})}{100}$$

The phosphorus content in the plant sample was estimated by vanado molybdateoposphoric yellow colour method (Jackson, 1973) [7]. From the results of the chemical analysis, phosphorus uptake was calculated as indicated below.

$$\text{P uptake (kg ha}^{-1}) = \frac{\text{P conc. (\%) x Wt. of dry matter (kg ha}^{-1})}{100}$$

The Potassium content in the plant sample was estimated by flame photometer after making appropriate dilution (Jackson, 1973) [7]. From the results of the chemical analysis, potassium uptake was calculated as indicated below.

$$\text{K uptake (kg ha}^{-1}) = \frac{\text{K conc. (\%) x Wt. of dry matter (kg ha}^{-1})}{100}$$

Weed index

Weed index of each treatment was calculated by using following formula (Gill and Kumar, 1969) [8].

$$\text{Weed Index (\%)} = \frac{X - Y}{X} \times 100$$

Where,
X - Yield from hand weeded plot.
Y – Yield from the treatment for which weed index is to be worked out.

Weed count were subjected to square root transformation, $\sqrt{X+0.5}$. All the experimental data were statistically analyzed and critical difference (CD) was worked out by the procedure as described by Gomez and Gomez (1984) [9].

Result and discussion-

Weed flora

The weed community comprised both broadleaved and grass weeds. The experiment field consisted with 5 weed species belonging to 5 families in the experimental plot.

Table 1: Floristic composition of weeds of the experimental field.

Botanical name	Common name	Family	Habit and characteristics
Grasses			
Phalaris minor	Canary grass	Poaceae	Tufted annual bunch grass, spike like panical.
Broad leaved weeds			
Rumex dentatus (L.)	Toothed dock, Aegean dock	Polygonaceae	Annual, erect with long taproots.
Meliotus indica (L.) All.	Sweet clover, Indian sweet clover	Fabaceae	Annual herb of 10-50cm, yellow flowers.
Chenopodium album (L.)	Lambsquarters, goosefoot	Chenopodiaceae	Annual, many branches, dull green flowers.
Launaea nudicaulis (L.)	Broad leaf launaea	Asteraceae	Perennial herb with a taproot and often shoot bearing lateral roots, up to 40-50 cm high.

Total weeds Density (m^{-2})

Weed control practices caused identical influence in reducing the density of total mean weed density at the different growth intervals during both the year. The Statistical analysis of the pooled data analyzed during the subsequent year perusal data showed that the lower weed density was found under hand weeding 30 DAS at 60 DAS (T9: 4.17 m^{-2}) over weedy check at 60DAS (T10: 37.84 m^{-2}) which was significantly higher rest of the weed control practices. The all weed control treatment was also reduce the total weed density over weedy check treatments. The 2, 4-D 0.5 lit ha^{-1} *fb* Metribuzin 0.250 Kg ha^{-1} (T5: 9.42 m^{-2}), 2, 4-D 0.5 lit ha^{-1} + hand weeding 30 DAS (T8: 9.50 m^{-2}) was also found more effective to reducing the total weeds density at 60 DAS under wheat- *Eucalyptus tereticornis* based agroforestry system.

Weed Dry weight (q ha^{-1})

The weed control practices have marked variation on the total dry weight of the weeds. The perusal data showed that the minimum dry weight of weeds was found under hand weeding 30 DAS (T9: 1.57 q ha^{-1}) over weedy check (T10: 18.02) which found significantly higher dry weight of weeds. All the weed control treatments were also reduced the total dry weight of weeds over weedy check. The hand weeding 30 DAS (T9: 1.57 q ha^{-1}) proved more effective over 2, 4-D 0.5 lit ha^{-1} *fb* metribuzin 0.250 Kg ha^{-1} (T5: 3.83 q ha^{-1}), 2, 4-D 0.5 lit ha^{-1} (T1: 4.16 q ha^{-1}) and 2, 4-D 0.5 lit ha^{-1} + hand weeding 30 DAS (T8: 4.22 q ha^{-1}) over rest of the weed control treatment as compared to weedy check (T10: 18.02 q ha^{-1}).

Weed Control Efficiency (%)

The result revealed that the highest weed control efficiency was found under Hand weeding 30 DAS (T9: 91.12%), 2, 4-D 0.5 lit ha^{-1} (T1: 79.08%), 2, 4-D 0.5 lit ha^{-1} *fb* metribuzin 0.250 Kg ha^{-1} (T5: 78.72), 2, 4-D 0.5 lit ha^{-1} + hand weeding 30 DAS (T8: 76.39%) and all the weed management treatment over weedy check under wheat- *Eucalyptus tereticornis* based agroforestry system. Saini and Chopra (2015) [18] also reported that the weed control efficiency of different weed control measures ranged from 83.8% to 97.4%. Higher weed control efficiency was achieved with mechanical weeding closely followed by hand-weeding twice. However, the lowest weed control efficiency (83.8%) was recorded for the treatment involving Butachlor 50 EC @ 1.5 kg a.i./ha. Amare *et al*. (2014) [1] also reported that Effect of weed management practices on weed control efficiency was significant at all crop growth stages. The highest weed control efficacy (78.40%) was recorded in hand weeding.

Nutrient uptake by weeds

Nitrogen: The statistical analysis of the pooled data analyzed during the subsequent year revealed that the among weed control treatments significantly minimum nitrogen uptake was found under hand weeding 30 DAS (T9: 1.77 kg ha^{-1}) over weedy check (T10: 28.46 kg ha^{-1}). Among herbicidal weed control treatment the minimum nitrogen uptake was found under 2, 4-D 0.5 lit ha^{-1} (T1 : 4.13 kg ha^{-1}), 2, 4-D 0.5 lit ha^{-1} *fb* metribuzin 0.250 Kg ha^{-1} (T5: 4.62 kg ha^{-1}) and 2, 4-D 0.5 lit ha^{-1} + hand weeding 30 DAS (T8: 4.75 kg ha^{-1}) over weedy check.

Phosphorus: The perusal data revealed that the among weed control treatments significantly minimum phosphorus was removed by hand weeding 30 DAS (T9: 0.25kg ha^{-1}) over weedy check (T10: 6.27 kg ha^{-1}). Among weed control treatment the minimum phosphorus uptake was found under 2, 4-D 0.5 lit ha^{-1} *fb* metribuzin 0.250 Kg ha^{-1} (T5: 0.72 kg ha^{-1}), 2, 4-D 0.5 lit ha^{-1} + hand weeding 30 DAS (T8 0.75 kg ha^{-1}) and 2, 4-D 0.5 lit ha^{-1} (T1 : 0.91 kg ha^{-1}), over weedy check which maximum removal of phosphorus under wheat- *Eucalyptus tereticornis* based agroforestry system.

Potassium: The result showed that the among weed control treatments significantly minimum potassium removal was observed in Hand Weeding 30 DAS (T9: 0.23.73 kg ha^{-1}) over weedy check (T10: 46.84 kg ha^{-1}). Among all weed control treatment the minimum phosphorus uptake was found under 2, 4-D 0.5 lit ha^{-1} *fb* metribuzin 0.250 Kg ha^{-1} (T5: 7.44 kg ha^{-1}), 2, 4-D 0.5 lit ha^{-1} + hand weeding 30 DAS (T8: 7.60 kg ha^{-1}) and 2, 4-D 0.5 lit ha^{-1} (T1 : 8.34 kg ha^{-1}), over weedy check which found maximum removal of phosphorus under wheat- *Eucalyptus tereticornis* based agroforestry system.

Nutrient uptake by wheat: The perusal result revealed that the nutrient uptake by wheat was found maximum under hand weeding 30 DAS nitrogen (T9: 68.13 kg ha^{-1}), phosphorus (T9: 29.14 kg ha^{-1}) and potassium (T9: 72.40 kg ha^{-1}) over weedy check (T10: 29.24 kg ha^{-1}), phosphorus (T10: 7.99 kg ha^{-1}) and potassium (T10: 37.08 kg ha^{-1}). The all other weed control treatment were also increased the nutrient uptake varied from nitrogen (36.31 to 54.69 kg ha^{-1}), phosphorus (12.45 to 22.65 kg ha^{-1}) and potassium (43.67 to 58.20 kg ha^{-1}) under wheat- *Eucalyptus tereticornis* based agroforestry system. Singh *et al*. (2009) [19], Bharat and Kachroo (2010) [4] and Kumar *et al*. (2010) [10, 11] also concluded that hand weeding twice at 30 and 45 days after sowing in wheat significantly reduced the NPK depletion by weeds over all the weed control treatments the main reason for this was lowest weed biomass under the treatments and significantly higher N,P,K uptake by wheat than herbicidal treatments for higher grain yield and straw yield.

Plant height (cm)

At harvest significantly higher plant height was found under hand weeding 30 DAS (T9: 70.72cm) over weedy check (T10: 63.33 cm) under wheat- *Eucalyptus tereticornis* based agroforestry system.

Leaf Area Index

The result showed that significantly higher Leaf area index was found in hand weeding 30 DAS at 60 DAS (T9: 2.77) over weedy check at 60 DAS (T10; 2.34. Among herbicidal treatments the higher leaf area index was found under Chlodinofop-properzyle 0.140 kg ha^{-1} at, 60 DAS (T4: 2.70) followed by 2, 4-D 0.5 lit ha^{-1} + hand weeding 30 DAS at 60 DAS (T8: 2.77) over weedy check at 60 DAS (T10: 2.34) under wheat- *Eucalyptus tereticornis* based agroforestry system.

Number of effective tillers/ MRL

The significantly higher number of effective tillers was found in hand weeding 30 DAS (T9: 72.33 /MRL) over weedy check (T10: 55.33/MRL). Among herbicidal treatment the higher number of effective tillers in Chlodinofop-properzyle 0.140 kg ha^{-1} (T4: 69.00/MRL) followed by 2, 4-D 0.5 lit ha^{-1} + hand weeding 30 DAS (T8: 67.67 /MRL) over weedy check (T10: 55.35/MRL) under wheat- *Eucalyptus tereticornis* based agroforestry system.

Number of grain/ear head

The significantly higher number of grain per ear head was found under hand weeding 30 DAS (T9: 28.00) over weedy check (T10: 16.50). Among herbicidal treatment higher number of grain was found under Chlodinofop-properzyle 0.140 kg ha^{-1} (T4: 26.33 cm) at par with 2, 4-D 0.5 lit ha^{-}1 + Hand weeding 30 DAS (T8: 26.33 cm) over weedy check (T10: 16.50) under wheat- *Eucalyptus tereticornis* based agroforestry system.

1000 grain weight

The significantly higher number of 1000 grain weight was found in hand weeding 30 DAS (T9: 29.83 g) over weedy check (T10: 22.23 g). Among herbicidal treatment weed control treatment the higher number of grain was found under Chlodinofop-properzyle 0.140 kg ha^{-1} (T4: 27.42 g) which was at par with 2, 4-D 0.5 lit ha^{-}1 + hand weeding 30 DAS (T8: 26.50 g) and Metribuzin 0.250 Kg ha^{-1} (T2: 26.50 g) over weedy check (T10: 22.23 g) under wheat- *Eucalyptus tereticornis* based agroforestry system.

Grain yield

The result revealed that the significantly higher grain yield was found under hand weeding 30 DAS (T9: 18.97 q ha^{-1}) which was significantly superior over weedy check (T10: 12.57 q ha^{-1}) and rest of the weed control treatments. Among herbicidal treatments the higher grain yield was found under Chlodinofop-properzyle 0.140 kg ha^{-1} (T4: 16.91 q ha^{-1}) followed by 2, 4-D 0.5 lit ha^{-1} + hand weeding 30 DAS (T8: 16.62 q ha^{-1}). The average yield was found 33.74% higher under hand weeding 30 DAS over Weedy check under wheat-*Eucalyptus tereticornis* based agroforestry system.

Straw yield

The significantly higher straw yield was found under hand weeding 30 DAS (T9: 43.13 q ha^{-1}) which was significantly superior over weedy check (T10: 31.83 q ha^{-1}) and rest of the weed control treatments. Among herbicidal treatment the higher straw yield was found under Chlodinofop-properzyle 0.140 kg ha^{-1} (T4: 37.94)q ha^{-1}) followed by metribuzin 0.250 Kg ha^{-1} (T2: 35.97 q ha^{-1}) and 2, 4-D 0.5 lit ha^{-1} *fb* metribuzin 0.250 Kg ha^{-1} (T5: 35.73 q ha^{-1}). The average yield was found 26.20% higher under hand weeding 30 DAS over weedy check under wheat- *Eucalyptus tereticornis* based agroforestry system.

Harvest index

The perusal data showed that higher harvest index was found under 2, 4-D 0.5 lit ha^{-1} + hand weeding 30 DAS (T8: 32.32%) followed by rest of the weed control treatments over weedy check (T10: 28.46%) under wheat- *Eucalyptus tereticornis* based agroforestry system. Pisal and Sagarka (2013) [17] and Verma *et al*. (2013) [20] also reported the weed free treatment recorded significant improvement in yield attributes, *viz*. number of effective tillers, spikelets per spike, 1000 grain weight. All the weed control treatments significantly influenced the grain yield, straw yield and harvest index of wheat over unweeded control.

Weed index (%)

The statistical analysis of the pooled data analyzed during the subsequent year revealed that the among weed control treatments, the maximum losses caused by weeds (T10: 39.73 %) in grain yield was noted in plots where weeds were allowed to grow with wheat crop under *Eucalyptus* tree during entire season. The loss of grain yield was significantly reduced where weeds were control by Weeding 30 DAS followed by Chlodinofop-propezyle 0.140 kg ha^{-1} (T4: 10.73%), 2, 4-D 0.5 lit ha^{-1} +hand weeding 30 DAS (T8: 14.43%), metribuzin 0.250 Kg ha^{-1} (T2: 14.63%), 2, 4-D 0.5 lit ha^{-1} (T1: 16.04%) and 2, 4-D 0.5 lit ha^{-1} *fb* metribuzin 0.250 Kg ha^{-1} (T5: 17.96%). However, the 2, 4-D 0.5 lit ha^{-1} *fb butachlore 1 lit ha-1* (T6: 22.38%), metribuzin 0.250 Kg ha^{-1} *fb* butachlore 1 lit ha^{-1} (T7: 24.36%) and butachlore 1 lit ha^{-1} (T3: 29.08%) had similar efficacy for reducing the yield losses.

Table 1: Weed density, dry weight and nutrient uptake of weeds and wheat under *Eucalyptus tereticornis* based Agroforestry system (pooled data of 2 years).

Treatment		Weed density 60 DAS (m^{-2})	Weed dry weight (q ha^{-1})	Weed Control Efficiency (%)	N- uptake by weeds (kg ha^{-1})	P- uptake by weed (kg ha^{-1})	K- uptake by weed (kg ha^{-1})	N- uptake by wheat (kg ha^{-1})	P- uptake by wheat (kg ha^{-1})	K- uptake by wheat (kg ha^{-1})
T_1	2, 4-D 0.5 lit ha^{-1}	3.42 (11.34)	2.01 (4.16)	79.08	4.13	0.91	8.34	43.40	15.75	51.47
T_2	Metribuzin 0.250 Kg ha^{-1}	3.57 (12.25)	2.40 (5.29)	70.07	6.66	1.21	9.96	45.92	16.80	52.15
T_3	Butachlore 1 lit ha^{-1}	4.10 (16.42)	2.80 (7.38)	58.04	8.94	1.89	14.56	36.31	12.45	43.67
T_4	Chlodinofop-propezyle 0.140 kg ha^{-1}	4.05 (16.05)	2.82 (7.50)	57.33	10.36	1.72	14.12	53.25	19.18	58.20
T_5	2, 4-D 0.5 lit ha^{-1} *fb* metribuzin 0.250 Kg ha^{-1}	3.13 (9.42)	2.05 (3.83)	78.72	4.62	0.72	7.44	48.79	19.07	53.40
T_6	2, 4-D 0.5 lit ha^{-1} *fb* butachlore 1 lit ha^{-1}	3.90 (14.75)	2.58 (6.21)	64.84	7.70	1.56	12.63	44.31	16.13	50.83
T_7	Metribuzin 0.250 Kg ha^{-1} *fb* butachlore 1 lit ha^{-1}	4.14 (16.75)	2.84 (7.58)	56.77	9.90	1.77	15.57	39.73	13.27	44.71
T_8	Hand weeding 30 DAS *fb* 2, 4-D 0.5 lit ha^{-1}	3.12 (9.50)	2.12 (4.22)	76.39	4.75	0.75	7.60	54.69	22.65	56.66
T_9	Hand Weeding 30 DAS	2.03 (4.17)	1.36 (1.57)	91.12	1.77	0.23	2.73	68.13	29.14	72.40
T_{10}	Weedy check	6.19 (37.84)	4.25 (18.02)	0.00	28.46	6.27	46.84	29.24	7.99	37.08
SEm±		0.17	0.11	2.29	0.73	0.14	0.98	**1.33**	**0.48**	**1.55**
Treatment (T) CD(P=0.05)		0.47	0.32	6.51	2.06	0.41	2.77	**3.78**	**1.36**	**4.39**

Data subjected to (√x+0.5) transformation, and figures in parentheses are original values

Table 1: Weed density, dry weight and nutrient uptake of weeds and wheat under *Eucalyptus tereticornis* based Agroforestry system (pooled data of 2 years).

Treatment		Plant height (cm)	LAI at 60 DAS	Number of effective tillers/MRL	No of grain/spike	1000 grain weight (g)	Grain Yield (q ha^{-1})	Straw Yield (q ha^{-1})	Harvest Index (%)	Weed index (%)
T_1	2, 4-D 0.5 lit ha^{-1}	68.33	2.61	66.17	22.17	25.83	15.92	35.56	31.09	16.04
T_2	Metribuzin 0.250 Kg ha^{-1}	68.77	2.64	66.83	24.33	26.50	16.18	35.97	31.16	14.63
T_3	Butachlore 1 lit ha^{-1}	64.67	2.45	63.83	17.00	23.28	13.41	32.18	29.53	29.08
T_4	Chlodinofop-propezyle 0.140 kg ha^{-1}	69.45	2.70	69.00	26.33	27.42	16.91	37.94	30.89	10.73
T_5	2, 4-D 0.5 lit ha^{-1} *fb* metribuzin 0.250 Kg ha^{-1}	67.95	2.58	66.33	19.67	25.50	15.54	35.73	30.40	17.96
T_6	2, 4-D 0.5 lit ha^{-1} *fb* butachlore 1 lit ha^{-1}	67.08	2.56	62.83	18.50	24.33	14.72	34.81	29.77	22.38
T_7	Metribuzin 0.250 Kg ha^{-1} *fb* butachlore 1 lit ha^{-1}	66.17	2.51	61.83	17.67	23.68	14.35	32.25	30.99	24.36
T_8	Hand weeding 30 DAS *fb* 2, 4-D 0.5 lit ha^{-1}	69.18	2.67	67.67	26.33	26.50	16.62	35.39	32.32	14.43
T_9	Hand Weeding 30 DAS	70.72	2.77	72.33	28.00	29.83	18.97	43.13	30.61	0.00
T_{10}	Weedy check	63.33	2.34	55.33	16.50	22.23	12.57	31.83	28.46	39.73
SEm±		0.42	0.01	0.52	0.37	0.55	0.33	0.79	0.57	2.60
Treatment (T) CD(P=0.05)		1.18	0.03	1.47	1.06	1.56	0.93	2.23	1.62	7.38

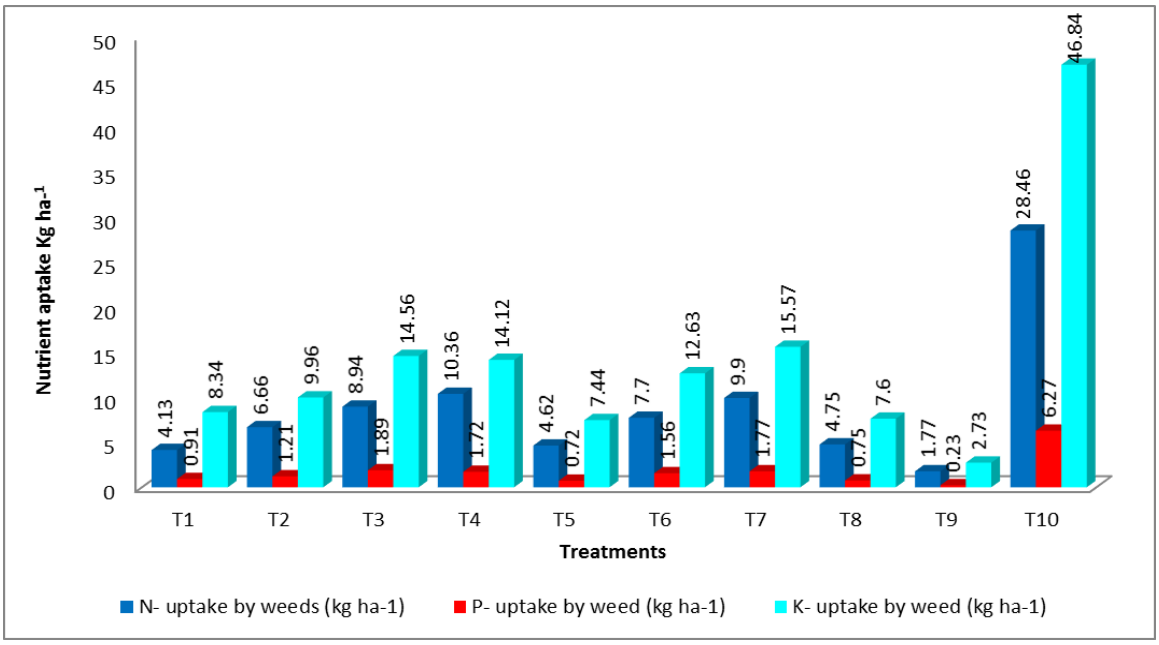

Fig 1: Nutrient uptake by weeds under *Eucalyptus tereticornis* based agroforestry system.

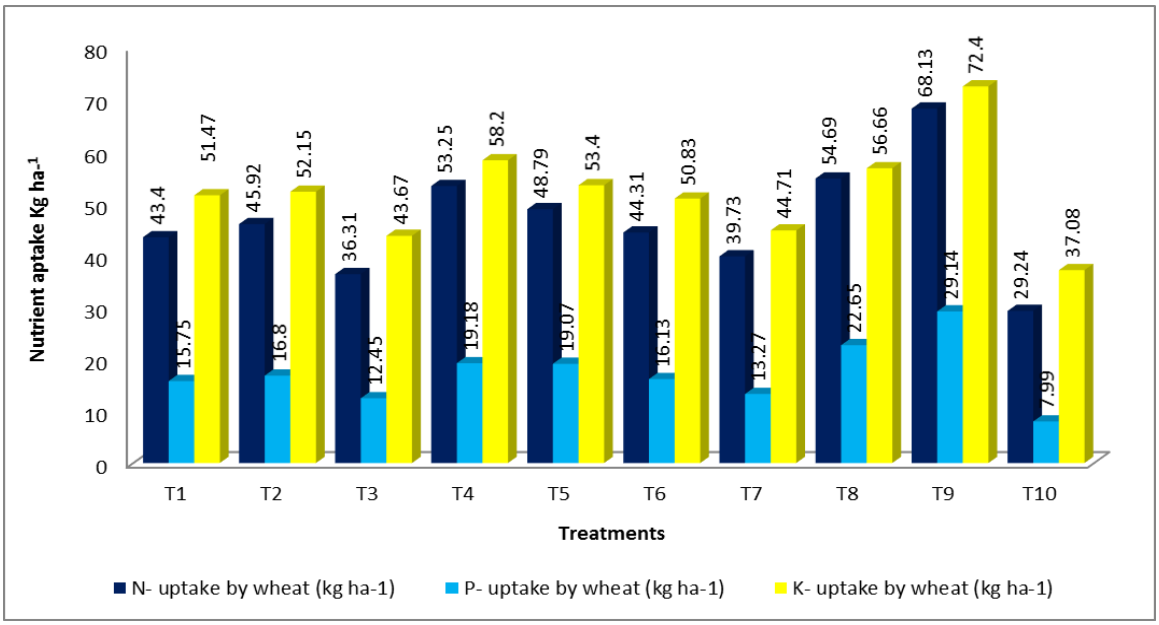

Fig 2: Nutrient uptake by Wheat under *Eucalyptus tereticornis* based agroforestry system.

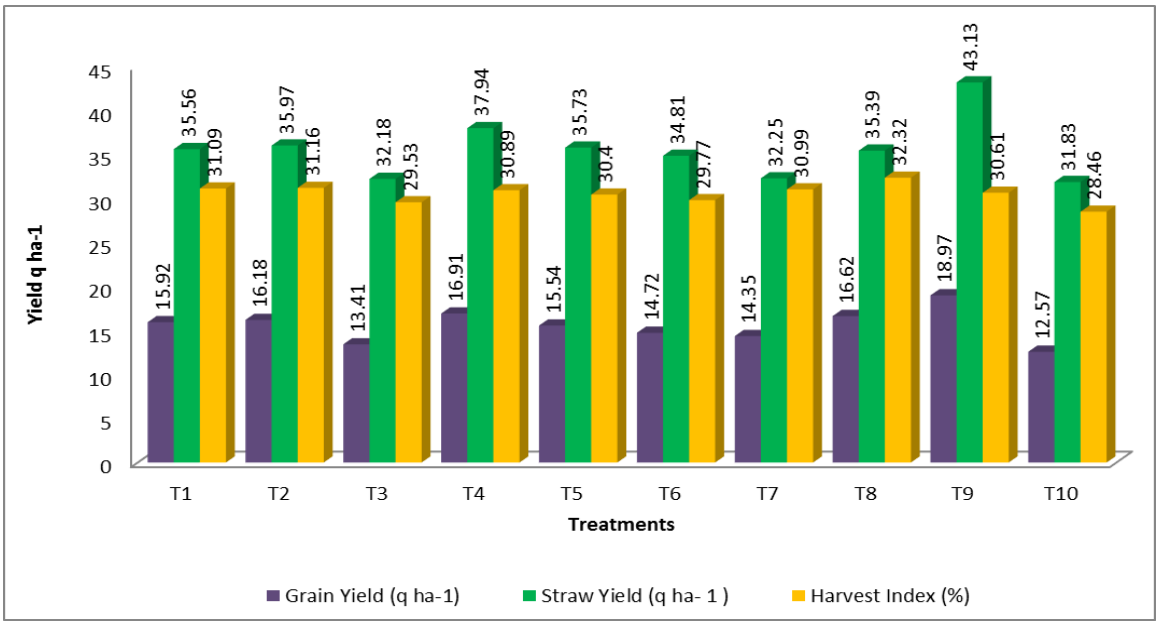

Fig 3: Grain yield, Straw yield and Harvest index of Wheat under *Eucalyptus tereticornis* based agroforestry system.

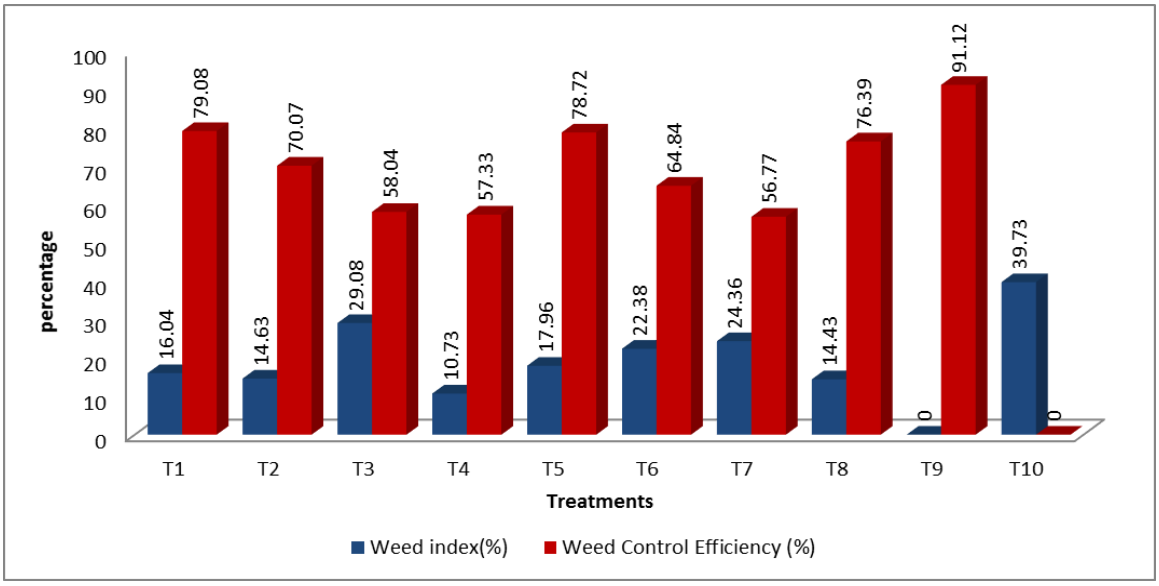

Fig 3: Weed index and Weed control efficiency under *Eucalyptus tereticornis* based agroforestry system.

Conclusion

From the two year experiment result, among the weed management practices it could conclude that hand weeding 30 DAS, clodinafop-propagyl at 0.140 kg ha^{-1} and 2,4D+ hand weeding 30 DAS reduce weed density, total weed density and dry weight of weeds at all stage of crop growth. These treatments also increase yield and yield component and uptake of nitrogen of wheat significantly.

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