

Effect of time of application on the efficacy of *Combi* and glyphosate against paragrass in non-cropped area

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ABSTRACT

An experiment was conducted during *rabi* season of 2006-07 and 2007-08 to evaluate the effect of time of application on the efficacy of *Combi* (mixture of glyphosate 35% + 2,4-D 35%) and glyphosate alone against weeds particularly Paragrass (*Brachiaria mutica*) in non-cropped area. All the herbicidal treatments had marked influence on the density, dry weight, shoot length and root length of *Brachiaria mutica*. Application of combinations 2.5 kg/ha during noon hours (12.00-14.00) totally killed *Brachiaria mutica* within 60 days in comparison of its evening and morning application as well as application of glyphosate alone at 2.0 and 2.5 kg/ha at the same time (noon), which took longer time (90 days) for total weed kill.

Key words: Day time effect, Efficacy, *Combi*, Glyphosate, *Brachiaria mutica*

India has 70.0 million ha area under non-crop, which is badly infested with perennial as well as annual monocot and dicot weeds (Agricultural Statistics, 2007-08). Weed flora in non-cropped situations is much more complex as compared to cropped area. So far, very little attention has been paid for weed control in non-cropped areas like industrial sites, airfields, road sides and field-bunds *etc.* Weeds under non-cropped situation not only reduce the value of lands, but also deteriorate the aesthetic look and cause many problems for movement of human beings as well as animals. They provide shelter to the insect-pests and diseases in off-season and are also prolific seed producers. Manual and mechanical measures of their control are not only costly and labour intensive, but also take more time. Presently, paraquat and glyphosate are being used as total weed killer in non-cropped areas. However, the time of application has been found to influence the efficacy of herbicides because inadequate absorption and translocation of herbicides affect, the herbicidal concentration at the site of action keeping below lethal limit. Consequently, the perennial weeds like *Cynodon dactylon*, *Saccharum spontaneum*, *Desmostachea bippinata* and *Brachiaria mutica* *etc.*, regenerate through their under ground vegetative parts and again infest the same non-cropped area within a short time (30-45 days) if herbicide molecules did not reach in lethal concentration at the site of action. Therefore, it is imperative to find out the right time of application of post emergent herbicides, particularly *combi* (ready mixture of glyphosate 35% + 2,

4-D 35%) and glyphosate alone for maximizing herbicidal activity.

MATERIALS AND METHODS

An experiment was conducted on the field bunds at Research Farm of Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur during *rabi* season of 2006-07 and 2007-08. The soil of the experimental plot was sandy loam in texture, fairly deep and free from water logging conditions, neutral in reaction pH (7.3), low in organic carbon (0.63%), available N (213 kg/ha), P (8.3 kg/ha) and medium in available K (303 kg/ha). Thirteen treatments consisted of 2 doses (2.0 and 2.5 kg/ha) each of glyphosate and *combi*, and time of applications (morning, noon and evening) including weedy check, were tested in randomized block design with 3 replications. The herbicides were applied with the help of knapsack sprayer fitted with flat fan nozzle using a 600 liters of water per hectare. Data on weed population were recorded at 15, 60 and 90 days after application (DAA) of herbicides in each plot with the help of a quadrat of 0.25 m² size. The weeds were up rooted and allowed for sun drying and then oven dried at 70°C temperature until constant weight was attained. Data on weed density and their dry weight were subjected to square root transformation before ($\sqrt{X+0.05}$) statistical analysis. The shoot length of the five randomly selected *Brachiaria mutica* plants from each plot was also measured from base level to the tip of the shoot at 15, 60

Table 1. Influence of time of application of glyphosate and combinations on dynamics of *Brachiaria mutica* (mean data of two seasons)

Treatment	Density (no./m ²)*			Dry weight (g/ m ²)*			Shoot length (cm)			Root length (cm)		
	15	60	90	15	60	90	15	60	90	15	60	90
Glyphosate 2.0 kg/ha – Morning	8.23 (67.3)	3.61 (12.6)	0.70 (0.0)	7.64 (58.5)	4.50 (20.3)	0.70 (0.0)	50.4	15.3	0.0	3.4	2.4	0.0
Glyphosate 2.0 kg/ha – Noon	7.96 (63.0)	2.95 (8.33)	0.70 (0.0)	7.50 (56.3)	4.26 (18.2)	0.70 (0.0)	49.7	11.7	0.0	3.2	2.1	0.0
Glyphosate 2.0 kg/ha – Evening	8.27 (68.0)	3.84 (14.3)	0.70 (0.0)	7.68 (59.1)	4.71 (22.2)	0.70 (0.0)	54.9	16.1	0.0	3.7	2.9	0.0
Glyphosate 2.5 kg/ha – Morning	8.15 (66.0)	3.01 (8.66)	0.70 (0.0)	7.57 (57.4)	4.38 (19.2)	0.70 (0.0)	47.2	10.6	0.0	3.3	2.2	0.0
Glyphosate 2.5 kg/ha – Noon	7.84 (61.0)	2.6 (6.33)	0.70 (0.0)	7.42 (55.2)	4.06 (16.0)	0.70 (0.0)	44.5	7.9	0.0	2.9	1.6	0.0
Glyphosate 2.5 kg/ha - Evening	8.25 (67.6)	3.21 (10.0)	0.70 (0.0)	7.64 (58.4)	4.54 (24.7)	0.70 (0.0)	49.1	12.0	0.0	3.4	2.4	0.0
Combinations 2.0 kg/ha – Morning	7.53 (56.3)	2.53 (6.0)	0.70 (0.0)	7.37 (54.4)	3.93 (15.0)	0.70 (0.0)	44.4	8.6	0.0	2.7	1.3	0.0
Combinations 2.0 kg/ha – Noon	7.38 (54.0)	2.11 (4.0)	0.70 (0.0)	7.05 (49.8)	3.68 (13.1)	0.70 (0.0)	41.6	6.6	0.0	2.4	0.9	0.0
Combinations 2.0 kg/ha – Evening	7.64 (58.0)	3.02 (8.66)	0.70 (0.0)	6.40 (54.9)	4.19 (17.6)	0.70 (0.0)	43.9	9.6	0.0	3.1	1.6	0.0
Combinations 2.5 kg/ha – Morning	7.44 (55.0)	1.73 (2.66)	0.70 (0.0)	6.94 (48.3)	2.14 (4.60)	0.70 (0.0)	42.2	6.1	0.0	2.7	0.5	0.0
Combinations 2.5 kg/ha – Noon	7.24 (52.0)	0.7 (0.0)	0.70 (0.0)	6.62 (43.9)	0.70 (0.0)	0.70 (0.0)	39.0	0.0	0.0	2.3	0.0	0.0
Combinations 2.5 kg/ha - Evening	7.51 (56.0)	2.25 (4.66)	0.70 (0.0)	7.07 (49.3)	2.92 (8.53)	0.70 (0.0)	44.3	7.4	0.0	2.7	1.2	0.0
Weedy check	8.47 (66.3)	8.91 (79.0)	9.17 (83.5)	7.8 (62.0)	8.31 (69.2)	8.52 (72.7)	57.3	71.4	74.1	4.1	6.7	6.7
LSD (P=0.05)	0.1	0.5	0.1	0.2	0.3	1.0	0.1	1.9	0.7	0.2	0.8	0.6

Figures in parenthesis are the original values , *Days after application

and 90 DAA of herbicides. Five *Brachiaria mutica* plants were dug out carefully from each treatment for measuring root length at all the stages.

RESULTS AND DISCUSSION

Brachiaria mutica - a perennial monocot weed was only the rampant weed in the experimental field, which alone constituted 75% of total weed population. Hence, studies were confined to *Brachiaria mutica* only. The weedy check plots receiving no weed control treatment had significantly higher density, dry weight and shoot as well as root length of *Brachiaria mutica* at 15, 60 and 90 DAA (Table 1). Though application of both the herbicides at different day times caused an appreciable reduction in density, dry weight, shoot length and root length of weeds, the reduction in density and dry weight of weeds was more pronounced when herbicides were applied during noon time. Application of combi 2.0 kg/ha made during noon hours in non-cropped area curbed the density, dry weight, shoot length and root length of *Brachiaria mutica* more identically compared to its application during evening and morning hours. The former treatment also proved superior to glyphosate with the same dose and time of application (2.0 kg/ha at noon) which caused only 12.86, 5.71, 13.26 and 41.46 per cent reduction in density, dry weight, shoot and root length of *Brachiria mutica*, respectively within 15 days of application. However, both the herbicides (combi 2.0 kg/ha and glyphosate 2.0 kg/ha) applied at noon were superior over their application at evening and morning hours including weedy check plots. This is because of more accumulation of combi (2.0 kg/ha) to the site of action in lethal concentration when applied during noon hours due to bright sunshine and more temperature, which probably caused more disruption of phloem tissues and synthesis of aromatic amino acids like phenyl alanine, tryptophan and tyrosine. This finally led to reduction in density, dry weight and root length of *Brachiaria mutica*. The application of combi at higher rate (2.5 kg/ha) during noon hours caused 14.52, 15.88, 31.93 and 43.90 per cent reduction in the density, dry weight, shoot and root length of *Brachiaria mutica*

, respectively, as compared to glyphosate (7.43, 4.87, 22.33 and 29.26%) at the same rate (2.5 kg/ha) and time of application at 15 DAA. But both the herbicides applied during noon proved significantly superior over their application made during evening and morning hours. A complete kill of *Brachiaria mutica* was achieved within 60 days with combi when applied at noon time at 2.5 kg/ha. Similar findings have also been reported by Waltz *et al.* (2004) and Young and Young (2006).

There was no resurgence in perennial weed *Brachiaria mutica* at 90 DAA in all treatments. This is because of complete check on growing point and root growth of *Brachiaria mutica* in plots receiving application of glyphosate and combi ready mixture of glyphosate + 2, 4-D each at 2.0 and 2.5 kg/ha at different day times. These findings are in close conformity to that of Ahuja and Yaduraju (1998), Shukla *et al.* (2008) and Sharma *et al.* (2008).

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