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Effect of different weed management practices on productivity and economic of Niger (*Guizotia abyssinica*)

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Abstract

The current research entitled “Effect of different weed management practices on productivity and economic of Niger (*Guizotia abyssinica*)” during *kharif* season of 2020, it was carried out at the Instructional cum Research Farm, DKS College of Agriculture and Research Station, Bhatapara with the objective of studying the effect of different weed management practices on Niger yield. The soil in the experimental field had a medium texture and levels of N, P₂O₅ and K₂O that were low, medium and high respectively. The climate is sub-humid to semi-arid in the region Niger was sown on 20th August, 2020 in randomized block design with 3 replication and 8 treatments *i.e.* Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence (T1), Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence + One hand weeding at 40 DAS (T2), Quizalofop ethyl @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) (T3), Quizalofop ethyl @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + wheel hoe at 40 DAS. (T4), Fenoxaprop-p- ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20) DAS (T5), Fenoxaprop-p-ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + Wheel hoe at 40 DAS. (T6), Weed free (T7) and Weed free (T8). Niger variety BN-1 was sown at 30 × 10 cm spacing using seed 10 kg ha⁻¹ with recommended level of nutrients 20:20:10 kg ha⁻¹ N: P₂O₅: K₂O. On the 20th November, 2020 the crop was harvested.

Keywords: Fenoxaprop-p- ethyl, quizalofop, pendimethalin, Niger, weed management

1. Introduction

Niger plant (*Guizotia abyssinica*) is an herbaceous green plant with bright yellow flowers in the Family Asteraceae. In India, Niger (*Guizotia abyssinica*) is an economically important oilseed crop extensively grown on the hill slopes and in coastal plains of Orissa, Chhattisgarh, and parts of Madhya Pradesh, Jharkhand, Bihar, Maharashtra, Karnataka, Andhra Pradesh and West Bengal. Niger (*Guizotia abyssinica*) is a crop of tribal region and is one of the most important minor oilseed crops of India (Anonymous, 2018) [1]. The natural habitat is disturbed for many reasons and the vegetation cover is declining now a day’s worldwide (Kearns *et al.*, 1998) [3]. Agriculture plays a role in declining native pollinators through the modification and elimination of pollinator habitats and the use of excess agricultural chemicals including pesticides, herbicides and fertilizers (Donaldson, 2002) [2].

Niger (*Guizotia abyssinica*) is an oilseed crop cultivated in India. It constitutes about 4% of Indian oilseed production. The Indian types contain 25% oleic and 55% linoleic acids (Donaldson *et al.*, 2002) [2]. The meal remaining after the oil extraction is free from any toxic substance but contains more crude fibre than most oilseed meals. The weed emerges along with the germinating Niger seedlings and parasitizes them soon by attaching themselves to the host and reduces the seed yield by 55–99% depending upon its intensity (Mishra *et al.*, 1981; Moorthy *et al.*, 2004)

Now day’s *parthenium* and *cynodon* are major threat to India Production. Weed infestation cause reduction in branching number and size of flower heads and seed per heads. Early infestations up to 45 days after sowing cause total yield losses. Due to infestation of weeds in Niger crop yield loss up to 85%. Continuous use of herbicides over a prolonged time leads to development of resistance in weed making them difficult to control. The combination of herbicide with mechanical weeding is effective in controlling major weeds. The herbicide weeds in row, whereas mechanical weeding removed weeds between rows. Under Chhattisgarh weed problematic grasses species are *Echinochloa colona* L,

Digitaria anguinalis L. *Cynodon dactylon* L, sedges species are *Cyperus rotundus* L, *Cyperus iria*, *Cyperus compestris*, and broad leaved weed species are *Parthenium hysterophorus* L., *Commelina benghalensis* L., *Euphorbia hirta* L, *Phyllanthus niruri*, *Chenopodium album* and Amaranthus species (Rajput, 2017) [6].

2. Materials and Methods

The field experiment was conducted at the Instructional Farm, DKS CARS Bhatapara, Chhattisgarh during *Kharif* season 2020-21.

The general climatic condition of Bhatapara is sub-humid to semi-arid. The mean annual precipitation of the region is 1326 mm (based on 80 years data evaluation), about 85% of rainfall is received during rainy season that is middle of June to September with occasional showers in winter and summer months. The weekly maximum temperature raises up to 46°C during summer and minimum temperature drop down as low as 6°C during winter season. The relative humidity is high from June to October and wind velocity is high from May to August with its peak in June-July months.

Recommended dose of N, P₂O₅ and K₂O *i.e.* 100: 60: 40 kg ha⁻¹ was applied through urea, single super phosphate and muriate of potash, respectively. The whole amount of P and K were applied as basal dressing during final land preparation. The nitrogen fertilizer was applied in two splits, 75% at basal, 25% at before flowering stage (50 DAS).

Weed management practices were adopted as per treatments mentioned in experimental details in Table. Herbicide was used in pre, early-post and post emergence in sequence was Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence, Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence + One hand weeding at 40 DAS, Quizalofop ethyl @ 37.5 g a.i./ ha⁻¹ as early post emergence (15-20 DAS), Quizalofop ethyl @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + wheel hoe at 40 DAS, Fenoxaprop-p- ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20) DAS and Fenoxaprop-p-ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + Wheel hoe at 40 DAS with above mentioned herbicide doses are proposed to evaluate the efficacy of herbicides for broad spectrum and cost effective weed control in Nigerat Instructional Farm, DKS CARS Bhatapara, Chhattisgarh.

The harvested produce from each net plot was tied in bundles separately. Straw yield of plot was calculated after subtraction of seed yield from bundle weight. Bundle weight was recorded with the help of spring balance and converted into kg ha⁻¹.

3. Results and Discussion

3.1 Number of capsules/plant

Data pertaining to number of capsules/plant as influenced by the different treatments is presented in Table 1. Significantly higher number of capsules/plant obtained in weed free treatment (39.10 capsules/plant) followed by Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence + One hand weeding at 40 DAS (37.20 capsules/plant), Quizalofop ethyl @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + wheel hoe at 40 DAS (36.20 capsules/plant), Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence (35.27 capsules/plant), Fenoxaprop-p-ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + Wheel hoe at 40 DAS (34.97

capsules/plant), Quizalofop ethyl @ 37.5 g a.i./ ha⁻¹ as early post emergence (15-20 DAS) (33.80 capsules/plant), Fenoxaprop-p- ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20) DAS (32.67 capsules/plant). Whereas, lowest number of capsules/plant was found in Weedy check (27.53 capsules/plant. Similar result recorded by Singh *et al.*, 2017 [7].

3.2 Number of seeds/capsules

Data pertaining to number of seeds/capsule as influenced by the different treatments is presented in Table 1. Significantly higher number of seeds/capsule obtained in weed free treatment (52.66 seeds/capsule) followed by Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence + One hand weeding at 40 DAS (49.44seeds/capsule), Quizalofop ethyl @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + wheel hoe at 40 DAS (48.44 seeds/capsule), Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence (47.11seeds/capsule), Fenoxaprop-p-ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + Wheel hoe at 40 DAS (45.93 seeds/capsule), Quizalofop ethyl @ 37.5 g a.i./ ha⁻¹ as early post emergence (15-20 DAS) (44.27seeds/capsule), Fenoxaprop-p- ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20) DAS (43.27 seeds/capsule). Whereas, lowest number of seeds/capsule was found in Weedy check (36.93 seeds/capsule) Similar result recorded by Singh *et al.* 2017 [7], Thakur and Dantre (2018) [9].

3.3 100 seed weight (gm)

Data pertaining to 100 seed weight as influenced by the different treatments is presented in Table 1. Significantly higher number of 100 seed weight obtained in weed free treatment (4.97 gm) which were at par with Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence + One hand weeding at 40 DAS (4.96gm) and Quizalofop ethyl @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + wheel hoe at 40 DAS (4.95 gm) followed by Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence and Fenoxaprop-p-ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + Wheel hoe at 40 DAS (4.94 gm), Quizalofop ethyl @ 37.5 g a.i./ ha⁻¹ as early post emergence (15-20 DAS) (4.90gm), Fenoxaprop-p- ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20) DAS (4.88 gm). Whereas, lowest number of 100 seed weight was found in Weedy check (4.85 gm).

3.4 Seed yield (kg./ha.)

Data pertaining to seed yield as influenced by the different treatments is presented in Table 2. Significantly higher seed yield obtained in weed free treatment (737 kg/ha) followed by Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence + One hand weeding at 40 DAS (664kg/ha), Quizalofop ethyl @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + wheel hoe at 40 DAS (648 kg/ha), Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence (615 kg/ha),Fenoxaprop-p-ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + Wheel hoe at 40 DAS (590 kg/ha), Quizalofop ethyl @ 37.5 g a.i./ ha⁻¹ as early post emergence (15-20 DAS) (560kg/ha), Fenoxaprop-p- ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20) DAS (536 kg/ha). Whereas, lowest seed yield was found in Weedy check (313 kg/ha). Similar result recorded in sunflower crop by Suryavanshi *et al.*, (2015) [8] and Wanjari *et al.*, (2000) [10].

3.5 Straw yield (kg./ha.)

Data pertaining to straw yield as influenced by the different treatments is presented in Table 2. Significantly higher straw yield obtained in weed free treatment (1134 kg/ha) followed by Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence + One hand weeding at 40 DAS (1109kg/ha), Quizalofop ethyl @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + wheel hoe at 40 DAS (1100 kg/ha), Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence (1059 kg/ha), Fenoxaprop-p-ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + Wheel hoe at 40 DAS (1037 kg/ha), Quizalofop ethyl @ 37.5 g a.i./ ha⁻¹ as early post emergence (15-20 DAS) (1008kg/ha), Fenoxaprop-p- ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20) DAS (997 kg/ha).Whereas, lowest straw yield was found in Weedy check (634 kg/ha). In similar result observed by Suryavanshi *et al.*, (2015) [8] and Wanjari *et al.*, (2000) [10].

3.6 Harvest index (%)

Data pertaining to harvest index as influenced by the different treatments is presented in Table.2. Significantly higher harvest index obtained in weed free treatment(39.54%) followed by Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence + One hand weeding at 40 DAS (37.46%), Quizalofop ethyl (targasu. per) @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + wheel hoe at 40 DAS (37.07%), Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence(36.77%), Fenoxaprop-p-ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + Wheel hoe at 40 DAS (36.26%), Quizalofop ethyl @ 37.5 g a.i./ ha⁻¹ as early post emergence (15-20 DAS) (35.69%), Fenoxaprop-p- ethyl 9.3% EC @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20) DAS (34.83%).Whereas, lowest harvest index was found in Weedy check (33.10%).

Table 1: Yield attributes as influenced by different weed management practices in Niger

Treatment	Yield attributes			
	Number of capsule plant ⁻¹	Number of seed capsule ⁻¹	100 seed weight (g)	
T1	Pendimethalin @ 0.75 kg a.i. ha ⁻¹ as pre emergence	35.27	47.11	4.94
T2	Pendimethalin @ 0.75 kg a.i. ha ⁻¹ as pre emergence + One hand weeding at 40 DAS	37.20	49.44	4.96
T3	Quizalofop ethyl @ 37.5 g a.i./ ha ⁻¹ as early post emergence (15-20 DAS)	33.80	44.27	4.90
T4	Quizalofop ethyl (targasu. per) @ 37.5 g a.i. ha ⁻¹ as early post emergence (15-20 DAS) + wheel hoe at 40 DAS	36.20	48.44	4.95
T5	Fenoxaprop-p- ethyl 9.3% EC @ 37.5 g a.i. ha ⁻¹ as early post emergence (15-20) DAS	32.67	43.27	4.88
T6	Fenoxaprop-p-ethyl 9.3% EC @ 37.5 g a.i. ha ⁻¹ as early post emergence (15-20 DAS) + Wheel hoe at 40 DAS	34.97	45.93	4.94
T7	Weed free	39.10	52.66	4.97
T8	Weedy check	27.53	36.93	4.85
	S.Em±	0.54	0.69	0.02
	CD (P=0.05%)	1.63	2.08	NS

Table 2: Yield as influenced by different weed management practices in Niger

Treatment	Yield			
	Seed yield (kg ha ⁻¹)	Straw yield (kg ha ⁻¹)	Harvest Index (%)	
T1	Pendimethalin @ 0.75 kg a.i. ha ⁻¹ as pre emergence	615	1059.	36.77
T2	Pendimethalin @ 0.75 kg a.i. ha ⁻¹ as pre emergence + One hand weeding at 40 DAS	664	1109	37.46
T3	Quizalofop ethyl @ 37.5 g a.i. ha ⁻¹ as early post emergence (15-20 DAS)	560	1008	35.69
T4	Quizalofop ethyl (targasu. per) @ 37.5 g a.i. ha ⁻¹ as early post emergence (15-20 DAS) + wheel hoe at 40 DAS	648	1100	37.07
T5	Fenoxaprop-p- ethyl 9.3% EC @ 37.5 g a.i. ha ⁻¹ as early post emergence (15-20) DAS	536	997	34.83
T6	Fenoxaprop-p-ethyl 9.3% EC @ 37.5 g a.i. ha ⁻¹ as early post emergence (15-20 DAS) + Wheel hoe at 40 DAS	590.	1037	36.26
T7	Weed free	737	1134	39.54
T8	Weedy check	313	634	33.10
	S.Em±	23.43	26.79	0.76
	CD (P=0.05%)	71.08	81.25	2.30

4. Conclusion

The results of the experiment further concluded that weed free treatment obtained higher value for yield contributing characters *viz.* number of capsules/plant, number of seeds/capsule, 100 seed weight (gm), seed yield (kg/ha), straw yield (kg/ha) and harvest index (%) followed by Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence + One hand weeding at 40 DAS and Quizalofop ethyl @ 37.5 g a.i. ha⁻¹ as early post emergence (15-20 DAS) + wheel hoe at 40 DAS. Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence was

found economically beneficial as compare to other treatments. The highest gross return of (52217 Rs/ha) was found in weed free treatment, however highest B:C ratio was recorded under weed free treatment (1.44) followed by Pendimethalin @ 0.75 kg a.i. ha⁻¹ as pre emergence (1.35).

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