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Management of Striga (Striga hermonthica) in Sorghum (Sorghum bicolor) at Jeldu District

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Abstract
Afield experiment was conducted from 2017 to 2018 to evaluate herbicides which can best perform against Striga in sorghum fields of Jeldu district West Shoa Zone. The experiment was carried out in randomized complete block design with three replications. Data was collected on crop and weed related parameters. Result obtained indicted that, Sorghum plant height, stock biomass, grain yield and thousand seed weight showed significant ($P<0.05$) difference due to treatments. The highest mean plant height (240.92 cm), Stock biomass (13967 kg/ha), grain yield (886.2 kg/ha) and thousand seed weight (24.3 gram) were recorded from the sequential application of Dual gold+ 2, 4-D as compared to weedy check. The lowest Striga height (31.917 cm) was recorded from sequential application of Dual gold+ 2, 4-D. Similarly, the lowest Striga biomass was recorded from farmers practice followed by Kerosene (for seed dressing) and sequential application of Dual gold+ 2, 4-D. Therefore, sequential application of Dual gold+ 2, 4-D was found effective against Striga weed in sorghum. hence, sequential application of Dual gold+ 2, 4-D can be recommended as one component of integrated Striga management in sorghum field.
Keywords: Dual gold, Sorghum bicolor, Striga hermonthica management, 2, 4-D
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Introduction

Ethiopia is the center of origin for sorghum varieties cultivated worldwide. Sorghum is one the most important cereal crops in the world, only exceeded by wheat and rice as staple food in the tropics and is a source of raw materials for many industrial products in Ethiopia.

Striga hermonthica which belongs to Scrophulariaceae family is one of the cereal crops root parasite often causing 30-100% crop losses on farmers' fields throughout the world (Ouedraogo, 1992). It is an important biotic constraint to sorghum and maize crop production, and the weed that the farmers fear most (Ramaiah, 1985). Striga species threaten the lives of over 100 million people in Africa and infest 40% of arable land in the Savannah region arable land may loss of US$ 7 to 13 million. According to (Baguma and Bigirwa, 1996) report the weed can cause an economic loss of US$ 8 million a year. Worldwide striga causes yield losses that range between 20% and 100% (Kim, 1991).

The herbicidal control of Striga prior to flowering and seed setting can contribute to reduction of the soil seed bank and subsequent Striga infestations. However, chemical control of striga is not widely practiced due to its high cost and the need for specialized equipment, unavailability on market; and environmentally unfriendly. In northern Cameron and Nigeria 2.4-D and triclopyr, Dual Gold (Metalachlor 960 EC), and Primagram have been applied at doses of and 1 l/ha. a.i. and 3 l. ha^{-1}, each as preemergence herbicides respectively. These herbicides reduced the number of striga species emerged leading increased sorghum yield (Carsky *et al*., 1994; Lagoke et al., 1994). On the otherhand Carson (1993) reported that 2.4-D was not effective for controlling of striga in maize in Gambia. Therefore, this proposal was designed with the objective of determining effective herbicides which can best perform against Striga in sorghum fields of West Shoa Zone districts.

Material and Methods

The evaluation work was conducted at Jeldu, District of West Shoa Zone on naturally striga infested sorghum fields. The experiment was laid out in RCBD with three replications. Treatments were application 2, 4-D at 85th days after sowing, primgram at 3 lit/ha; Dual Gold (Metalachlor 960 EC) at 3 l/ha; 2.4-D at liter/ha + Primagram at 3 litter/ ha; 2.4-D at lit/ha + Dual Gold (Metalachlor 960 EC) at 3 liter/ha; Kerosene (For seed dressing); farmers practice and weedy check. Post emergence herbicide 2.4-D; was applied at 85th day after sowing and pre emergence herbicide Dual Gold (Metalachlor960 EC) and primgram were applied at one day after sowing. Improved variety of sorghum "Alemaya ETS-2752" was used as test crop. The size of each plot was 6m x 5m with a distance of 1 m between plots and 1.5m between block were left to avoid spray drift from adjacent plot.

Data collection

Data on yield and yield component of Sorghum such as: Sorghum plant count, plant height, stock biomass, grain yield and 1000 seed weight were recorded. In addition to that data on Striga plant count per plot, height, and biomass were collected. Analysis of variance was done using appropriate computer software.

Results and Discussion

Effect of herbicides on yield and yield components of Sorghum

Sorghum plant height, stock biomass, grain yield and thousand seed weight showed significant ($P<0.05$) difference due to herbicides (Table1). The highest mean plant height, Stock biomass and grain yield were recorded from the sequential application of Dual gold+ 2, 4-D as compared to weedy check. The highest thousand seed weight was also recorded from sequential application of Dual gold+ 2, 4-D and 2, 4-D. Therefore, this indicated that sequential application of Dual gold+ 2, 4-D was effective in increasing plant height, crop biomass and grain yield of sorghum as compared to other treatments. However, Sorghum plant population showed non-significant due to herbicide treatment.

Effect of herbicides on Striga population, height and biomass

Striga population and biomass showed non-significant difference among treatments. However, the highest Striga population (16333 per hectare) was recorded from the application of 2, 4-D followed by sequential application of Dual gold + 2, 4-D. Striga height showed significant ($P<0.05$) difference due to herbicides (Table2). The lowest Striga height (31.917 cm) was recorded from sequential application of Dual gold+ 2, 4-D. Similarly, the lowest Striga biomass were recorded from farmers practice followed by Kerosene (for seed dressing) and sequential application of Dual gold+ 2, 4-D. This finding indicated that Striga population, height and biomass were influenced by application of herbicides. Therefore, sequential application of Dual gold+ 2, 4-D was effective in controlling Striga in sorghum field and can be recommended as integrated Striga management in sorghum fields.

Table1. Effect of herbicides on sorghum height, population density, stock biomass, thousand seeds weight and grain yield at Jeldu district of West Shoa Zone, 2017-2018 cropping season

Treatments	Plant height (cm)	population /ha	biomass (kg/ha)	yield (kg/ha)	1000 seeds weight (g)
Year 2017	236.083 ^{a}	29817 ^{b}	11067	716.8 ^{a}	24.2167 ^{a}
Year 2018	209.042 ^{b}	66967 ^{a}	9518	473.5 ^{b}	22.5125 ^{b}
LSD	13.787	6138.8	ns	204.55	1.2547
2,4-D	225.08 ^{ab}	48000	12800 ^{ab}	666.6 ^{ab}	24.383 ^{a}
Primagram	228.58 ^{ab}	50200	9933 ^{abc}	564.3 ^{ab}	23.950 ^{ab}
Dual gold	217.50 ^{ab}	47533	7967 ^{bc}	497.2 ^{ab}	21.617 ^{b}
Dual gold+ 2,4-D	240.92 ^{a}	51000	13967 ^{a}	886.2 ^{a}	24.300 ^{a}
Primagram+2,4-D	222.67 ^{ab}	44067	12200 ^{ab}	609.2 ^{ab}	23.583 ^{ab}
Kerosene (for seed dressing)	227.67 ^{ab}	47667	11367 ^{ab}	674.8 ^{ab}	23.933 ^{ab}
Farmers practice	211.75 ^{b}	50667	8140 ^{bc}	510.4 ^{ab}	22.833 ^{ab}
Un treated	206.33^{b}	48000	5967 ^{c}	352.4 ^{b}	22.317 ^{ab}
LSD (0.05)	27.573	Ns	4886.5	409.11	2.5094
CV%	10.50	21.517	40.26	58.3	9.108

***Note**: Means followed by the same letter within a column are not significantly different at 0.05p; ns: non significantly different*

Table2. Effect of herbicide on striga population and height and biomass at West Shoa Zone of Jaldu district, 2017-2018

Treatments	population /ha	height (cm)	biomass (kg/ha)
Year 2017	23000	43.717 ^{a}	278 ^{b}
Year 2018	29742	33.119 ^{b}	60348 ^{a}
LSD	Ns	3.7304	35717
2,4-D	16333	41.700 ^{a}	213.3
Primgram	38333	40.694 ^{a}	466.7
Dual gold	32000	39.856 ^{a}	386.7
Dual gold+ 2,4-D	10067	31.917 b	200.0
Primagram+2,4-D	28767	38.265 ^{ab}	253.3
Kerosene (for seed dressing)	18000	38.183 ^{ab}	200.0
Farmers practice	17000	39.246 ^{ab}	146.7
Un treated	50467	37.480 ^{ab}	360.0
LSD (0.05)	Ns	7.4608	ns
CV%	130.69	16.47	199.856

***Note**: Means followed by the same letter within a column are not significantly different at 0.05p;*
ns: non significantly different

Conclusion and Recommendation

Sorghum height, biomass, grain yield, thousand seeds weight and striga height showed significant ($P<0.05$) difference due to the application of herbicides. The highest sorghum height, biomass, grain yield and thousand seeds weight were recorded from sequential application of Dual gold + 2,4-D. Similarly, significantly lowest striga height was recorded from sequential application of Dual gold+ 2, 4-D as compared to the other treatments. Therefore, sequential application of Dual gold + 2,4-D was found effective against striga weed and in improving sorghum productivity. Hence, sequential application of Dual gold + 2,4-D can be recommended as one component for integrated striga management in sorghum fields.

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