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EFFECT OF INTERCROPPED *Aeschynomene histrix* AND MAIZE (*Zea mays* L) ON *Striga hermonthica* AT LAPAI AND MOKWA, NIGER STATE, NIGERIA

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ABSTRACT

The trials were conducted at crop farm of IBBU Lapai (09°-02'N; 06° 34'E) and Niger State College of Agriculture crops farms, Mokwa (09° 18'N; 05° 04'E) in 2011 and 2012 cropping seasons. The objective was to evaluate the effect of intercropping maize and *Aeschynomene histrix* on *Striga hermonthica* management at Lapai and Mokwa, Southern Guinea Savannah of Nigeria. The experiments were laid out in a Randomized Complete Block Design (RCBD) consisted of five (5) treatments viz., sole maize without infestation, sole *Aeschynomene*, sole maize under *Striga* infestation, intercropped maize with *Aeschynomene* and intercropped maize with *Aeschynomene* under *Striga* infestation replicated three (3) times. The result showed that under *Striga* infestation, intercropped maize were taller and more vigorous, having lower reaction syndrome to *Striga* parasitism and *Striga* shoot emergence which resulted in the production of higher grain yield compared with the sole

Striga hermonthicais one of the most important and aggressive parasite weeds which affect the production of maize in the tropics (Parker and Riches, 1993; Riches and Parker, 1997; AATF, 2006). The weed has a marked influence on the growth and allometry of its host. Losses in the yield of cereal due to *Striga* alone were reported to be greater than those from diseases and pests combined (Babawi et al., 1984; Isah and Lagoke, 2010). The greatest damage occurs in Savanna agro-ecological zones which constituted the major areas of maize production. A conservative estimate of losses due to *Striga* spp. in Africa is 40% of crop yield representing an annual loss of maize value of US 2.9 to 7billion dolars (M'Boob, 1986; Sauerborn, 1991). In Nigeria, *Striga* has been reported to cause 10-100% maize yield loss, depending on the incidence, level of infestation and distribution of the parasitic weed, the crop variety, location and cultural practices in use (Lagoke and Isah, 2010; Isah and Niranjan, 2011). Lagoke and Isah, 2010 also reported reduce maize reaction score which resulted in higher growth yield when it was intercropped with groundnut variety SAMNUT II and soybeans TGX 1448-ZE. Trap crop are those plants which stimulate germination of *Striga* seed without being parasitized. Carson (1989) has found that the density of emerged *Striga* plant was reduced when sorghum was intercropped with groundnut in the Gambia. Similar result was obtained in northern Cameroon where sorghum intercropped with cowpea produce the best yield of sorghum and greater reduction of *Striga* (Carsky et al., 1994). The potential of *Aeschymene histrix* as a pasture legume for well-drained soil in dry areas has been recognized since the late 1970's. It is used as pasture legume crop to feed livestock and in addition, add nutrients to the soil. Experiments in South America and West Africa highlight that it contained crude protein with average good dry matter digestibility, reasonable drought tolerance, good dry matter production and have ability to compete with weeds of particular interest for agriculture production system in West Africa. *Aeschynomene histrix* also act as a trap crop for *Striga hermonthica*, a noxious parasitic weed limiting crop yield (Costa et al., 1993; Peter et al., 1994; Tarawali et al., 1999). Many research work for intercropping of food legume crops (cowpea, groundnut, soybean as well as cotton) with maize had earlier been reported (Isah et al., 2009; Isah and Lagoke, 2010; Lagoke and Isah, 2010) but only few research had been done on the intercropping of non-food legumes such as Centrosema, *Muccuna* and *Aeschynomene* with maize. The objective of this study was to evaluate the effect of intercropping maize and *Aeschynomene histrix* on *Striga hermonthica* management at Lapai and Mokwa, Southern Guinea Savannah of Nigeria.

MATERIALS AND METHODS

The trials were conducted at crop farm of IBBU Lapai (09°-02'N; 06° 34'E) and Niger State College of

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Agriculture crops farms, Mokwa (09° 18'N; 05° 04'E) in 2011 and 2012 cropping seasons . The soils of the infested plots were further inoculated with 3,000 germinable *Striga* seeds for uniformity. The experiments were laid out in a Randomized Complete Block Design (RCBD) consisted of five (5) treatments viz., sole maize without infestation, sole *Aeschynomene*, sole maize under *Striga* infestation, intercropped maize with *Aeschynomene* and intercropped maize with *Aeschynomene* under *Striga* infestation replicated three (3) times. Each plot consisted of six (6) ridges at 75cm wide (4.5m) and 4m long i.e. plot size is 4.5m x 4m (18m2) with 1m pathway The land was ploughed using tractor mounted equipment and ridged at a week interval after ploughing manually at 75cm wide. The maize seed planted TZL Comp. 1- Y- STR, *Striga hermonthica* and *Aeschynomene histrix* seeds were all sourced from IITA sub-station, Mokwa. Four seeds were planted per stand at 50cm intra row spacing. At two weeks after planting (WAP), it was thinned down to two plants per stand.

Weeding was done twice at 5 and 6 WAP manually. Thereafter, other emerging weeds found on the plots were hand pulled. Emerged *Striga* plants were not removed. A total of 100kgs N/ha, 50kg P_2O_5/ha and 50kg, K_2O/ha was applied. Half dose of N and full doses of P_2O_5 and K_2O was applied at 3 WAP using NPK 15- 15-15 and the remaining half dose of N was applied at 6 WAP using urea. Parameters measured include, maize stand count at 2 WAP and height at harvest, vigour and reaction scores at 9 WAP. *Striga* shoot count was taken at 9 and 12 WAP, and grain yield of maize at harvest in kg/ha. *Aeschynomene* shoot dry weight at harvest kg/ha was also taken. The data collected was subjected to analysis of variance (ANOVA) and means separated using least significant difference (LSD) at 5% probability.

RESULTS

Stand Count at 2 WAP

Establishment counts were not significantly different at P = 0.05 in the two locations at both years (table 1)

Maize Height

The height of maize plant differed significantly among the treatments at 5% probability at the two locations in both years of the study (Table 1). Sole maize and the intercrop with *Aeschynomene* without *Striga* infestation were significantly taller compared with those grown under *Striga* infestation. Also, under *Striga* infestation, the intercropped maize with *Aeschynomene* were significantly taller compared with sole.

Maize Vigour Score

Maize vigour score was significantly among the treatments at 5% probability (table 2). Maize planted sole as well as those planted in intercrop with *Aeschynomene* without *Striga* infestation were significantly more vigorous compared with sole and intercropped maize with

Table 1 : Effects of Intercropped Maize and *Aeschynomene* in the Management of *Striga hermonthica* on the Stand Count and Height of Maize at Lapai and Mokwa.2011 and 2012 Cropping Seasons

Treatments	Maize stand count/ 18m^2 at 2 WAP[1]				Maize height (cm) at harvest			
	2011		2012		2011		2012	
	Lapai	Mokwa	Lapai	Mokwa	Lapai	Mokwa	Lapai	Mokwa
Sole maize, no infestation	53.3	50.0	53.7	53.5	156.7a[2]	161.2a	158.3a	164.9a
Sole *Aeschynomene*	_[3]	_	_	_	_	_	_	_
Sole maize infested	52.7	49.9	53.3	53.7	67.8c	45.3c	71.6c	50.7c
Maize +*Aeschynomene*	51.9	52.9	52.7	53.1	155.2a	167.6a	160.1a	167.9a
Maize+ *Aeschynomene* infested	52.0	51.3	53.1	52.7	146.8b	150.4b	151.4b	152. 6b
SE±	0.67	1.45	0.55	0.62	1.51	3.24	2.34	3.17
LSD (P = 0.05)	1.42	3.01	1.32	1.41	3.42	7.05	4.99	6.54

1-WAP = Weeks After Planting

2-Means followed by the same letter(s) within a column is(are) not significantly different (P = 0.05)

3-Data not available

Table 2 : Effects of Intercropped Maize and *Aeschynomene* in the Management of *Striga hermonthicaon* Maize Vigour and Reaction Scores at Lapai and Mokwa 2011 and 2012 Cropping Seasons

Treatments	Maize vigourscore[1] at 9 WAP[2]				Maize reaction score[3] at 9 WAP			
	2011		2012		2011		2012	
	Lapai	Mokwa	Lapai	Mokwa	Lapai	Mokwa	Lapai	Mokwa
Sole maize, no infestation	4.7a[4]	4.3a	4.5a	4.3a	2.1c	2.7c	2.4b	3.1b
Sole *Aeschynomene*	_[5]	_	_	_	_	_	_	_
Sole maize infested	1.7c	1.1c	1.9c	1.3c	7.7a	8.3a	8.1a	8.7a
Maize + *Aeschynomene*	4.7a	4.7a	4.7a	4.5a	1.1d	1.3d	1.7c	1.7c
Maize + *Aeschynomene* infested	2.3b	2.9b	2.7b	2.0b	3.7b	3.3b	3.0b	3.3b
SE±	0.03	0.19	0.17	0.12	0.21	0.24	0.28	0.23
LSD (P = 0.05)	0.11	0.41	0.37	0.26	0.43	0.46	0.61	0.50

1- Maize vigour score ranging between 1 to 5 where 1 indicates not vigourous and 5 very vigourous
2- WAP = Weeks After Planting
3- Maize reaction score ranged between 1 to 9 where 1 indicates normal plant growth and 9 poor growth
4- Means followed by the same letter(s) within a column is(are) not significantly different (P = 0.05) Data not available
5- Data not available

Aeschynomene under *Striga* infestation. In addition, under *Striga* infestations, the intercropped maize with *Aeschynomene* were significantly taller compared with sole.

Maize Reaction Score

The reaction of maize plant to *Striga* differed significantly among the treatments in the two locations at both years (Table 2). Maize reaction score differed significantly following the order Sole maize infested > Maize + *Aeschynomene* infested > Sole maize without infestation > Maize + *Aeschynomene* without infestation by Striga at both locations in 2011. However,the trend was in the order Sole maize infested > Maize + *Aeschynomene* infested = Sole maize without infestation > Maize + *Aeschynomene* without infestation by *Striga* at both locations in 2012.

***Striga* Shoot Count**

Striga shoot count differed significantly among the

Table 3 : Effects of Intercropped Maize and *Aeschynomene* on the management of *Striga hermonthica* Shoot Count at Lapai and Mokwa, 2011 and 2012 Cropping Season

Treatments	*Striga* shoot count/ 18m^2							
	9 WAP[1]				12 WAP			
	2011		2012		2011		2012	
	Lapai	Mokwa	Lapai	Mokwa	Lapai	Mokwa	Lapai	Mokwa
Sole maize, no infestation	_[2]	_	_	_	_	_	_	_
Sole *Aeschynomene*	_	_	_	_	_	_	_	_
Sole maize infested with *Striga*	20.1a[3]	31.4a	15.6a	24.5a	23.7a	38.9a	18.4a	27.2a
Intercropped maize and *Aeschynomene*	_	_	_	_	_	_	_	_
Intercropped maize and *Aeschynomene* under *Striga* infestation	5.4b	8.6b	4.2b	6.8b	7.7b	15.3b	9.2b	12.9b
SE±	1.45	2.01	1.32	1.72	2.44	3.03	2.03	1.87
LSD at 5% probability	3.11	4.21	2.71	3.64	4.97	9.12	4.23	3.81

1-WAP = Weeks After Planting

2-Data not available

3-Means followed by the same letter(s) within a column is(are) not significantly different (P = 0.05)

Table 4 : Effects of Intercropped Maize and *Aeschynomene* in the Management of *Striga hermonthica* on Maize Grain Yield and *Aeschynomene* Shoot Dry Weight at Lapai and Mokwa. 2011 and 2012 Cropping Seasonse

Treatments	Maize grain yield (kg/ha)				*Aeschynomene* shoot dry weight (kg/ha)			
	2011		2012		2011		2012	
	Lapai	Mokwa	Lapai	Mokwa	Lapai	Mokwa	Lapai	Mokwa
Sole maize, no infestation	3084a[1]	2834a	3126a	3241a	_	_	_	_
Sole *Aeschynomene*	_[2]	_	_	_	940a	812a	932a	890a
Sole maize infested	1122d	1245c	1035d	1078c	_	_	_	_
Maize + *Aeschynomene*	2815b	2790a	2847b	3012a	710b	643b	793b	602b
Maize + *Aeschynomene* infested	2012c	2183b	2443c	2506b	698b	629b	734b	611b
SE±	100.3	121.3	101.4	119.6	34.7	39.6	29.4	27.8
LSD (P = 0.05)	209.1	243.8	207.5	234.8	70.2	81.3	60.6	55.9

1-Means followed by the same letter(s) within a column is (are) not significantly different (P = 0.05)

2-Data not available

treatments at the two locations in 2011 and 2012 at 9 and 12 WAP (table 3). Sole maize supported significantly higher number of *Striga* emergence compared with the intercrop with *Aeschynomene* under *Striga* infestation throughout the plant growth period.

Maize Grain Yield

Maize grain yield was significantly different among the treatments at both locations in the two years (table 4). At Lapai location, it significantly followed the order, sole maize without infestation > intercropped maize/*Aeschynomene* with no infestation > intercropped maize/ *Aeschynomene* under infestation>sole maize infested. While, at Mokwa location, sole maize without infestation and intercropped maize/ *Aeschynomene* with no infestation supported significantly higher maize grain yield compared with both intercropped and sole maize under *Striga* infestation. However, under *Striga* infestation the intercropped supported significantly higher maize grain yield compared with the sole planting.

***Aeschynomene* Shoot Dry Weight**

Shoot dry weight of *Aeschynomene* was significantly different among the treatments at both locations in the two years (Table 4). *Aeschynomene* planted sole produced significantly higher shoot dry weight compared with when planted in intercrop.

DISCUSSION

Under *Striga* infestation, intercropped maize were taller and more vigorous, having lower reaction syndrome to *Striga* parasitism and *Striga* shoot emergence which resulted in the production of higher grain yield compared with the sole. This is an indication that intercrops especially between spreading and non-spreading crops offers great potentials as a cultural practice for reducing *Striga* damage among the poor resource farmers (Gworgwor, 2000; Isah et al., 2009; Lagoke and Isah, 2010). *Aeschynomene* histrix has also been reported to act as a trap crop for *Striga* hermonthica, a noxious parasitic weed limiting crop yield (Costa et al., 1993; Peter et al., 1994; Tarawali et al., 1999). This trap cropping has the ability to reduce *Striga* seed bank in the soil by causing suicidal germination of the parasite without being parasitized. The result of this study therefore, confirms that intercrop maize with *Aeschynomene* will go a long way in reducing *Striga* hermonthica parasitism.

Moreso, under non- infestation, intercropped maize produced more yield compared with the sole at Mokwa location only. This might be due to ecological variation. Although, Mokwa and Lapai belong to Southern Guinea Savanna (SGS) agro-ecological zone of Nigeria, Mokwa is in the southern SGS while Lapai is in the northern part. This might be responsible for this variation. Even the virulence of the *Striga* found in those locations was not the same. Isah and Niranjan, 2012 had earlier reported that *Striga* emergence, vigour score and grain yield of cereals

differed significantly following the order Gboko and Mokwa> Abuja and Bida (close to Lapai) > Zaria and Kano but reaction syndrome following a reverse order.Also in the study of upland rice varieties to ecotypes of *S. hermonthica*, it was reported that FARO 40 supported the emergence of Ex-Lafia and Ex-Mokwa ecotypes of *Striga* only but not those of Ex-Samaru, Ex-Bagauda and Ex-Bida (Adagba, 2000; Adagba et al., 2002; Adagba et al., 2003).

CONCLUSION

Based on the result of this finding intercropped offers great potentials as a cultural practice for reducing *Striga* damage among the poor resource farmers. Intercropped maize with *Aeschynomene* will go a long way in reducing *Striga* hermonthica parasitism.

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