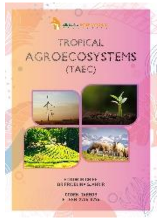
ZIBELINE INTERNATIONAL PUBLISHING

ISSN: 2735-0274 (Online)
CODEN: TARGDB

Tropical Agroecosystems (TAEC)

DOI: http://doi.org/10.26480/taec.02.2022.63.70



CrossMark

RESEARCH ARTICLE

STRIGA HERMONTHICA SUICIDAL GERMINATION ACTIVITY OF TEN SOYABEAN, COWPEA AND GROUNDNUT VARIETIES IN NIGER STATE, NIGERIA

Mamudu, A.Y.

Department of Crop Production, Federal University of Technology Minna, Niger State Nigeria.
****Corresponding Author Email: a.mamudu@futminna.edu.ng***

ARTICLE DETAILS

Article History:

Received 10 July 2022
Accepted 13 August 2022
Available online 18 August 2022

ABSTRACT

The obligate hemiparasite *Striga hermonthica* is one of the major global biotic threats to agriculture in sub-Saharan Africa, causing severe yield losses of cereals. The germination of *Striga* seeds relies on host-released signaling molecules, mainly Strigolactones (SLs). Strigolactones (SLs) are plant hormones that regulate the branching of plants and seed germination stimulants of root parasitic plants. *Striga hermonthica*'s non-hosts stimulate parasite seed to germinate without getting infected because the non-hosts produce unique germination stimulants Strigolactones). This phenomenon called suicidal seed germination is greatly used in *S. hermonthica* control. For improved efficiency of the suicidal seed germination method in *S. hermonthica* control, detailed analysis of comparative ability of potential trap crops to stimulate germination is critical. This study was undertaken with the aim to screen 10 genotypes each of soybean, cowpea and groundnut as trap crops for *Striga*: the potential ability of their root exudates to stimulate germination of *Striga* seed was evaluated. The results indicate that soyabean varieties TGX 1019-2EB and TGX 1448-2E delayed *Striga* emergence in 2013 and 2014 respectively compared to other varieties. In the results of the *Striga* count, plant height and grain yield, Soyabean variety TGX 1448-2E generally performed better than other varieties. 2.5 g *Striga* level gave better results in all the parameters measured compared to 5 g *Striga* level. Cowpea varieties IT04K-339-1 and IT07K-25-3-3 delayed *Striga* emergence in 2013 and 2014 respectively, while in *Striga* count and plant height, cowpea variety IT04K-217-5 performed better than other varieties but higher grain yield was recorded in cowpea variety IT04K-339-1 compared to other varieties. Groundnut varieties TES, QH 243C, RMP-12 and RMP-91 delayed *Striga* emergence compared to other varieties in 2014. Groundnut variety RMP-91 performed better in *Striga* count, plant height and grain yield in both planting years 2013 and 2014 compared to other varieties.

KEYWORDS

Striga hermonthica, Suicidal germination, Witch weeds

1. INTRODUCTION

Striga hermonthica, an obligate root-parasitic weed, is one of the major biotic constraints to cereal production in sub-Saharan Africa (Jamil et al., 2021). The crop yield losses due to *Striga* infestation can vary from 40 to 100%, causing annual losses of around US $10 billion and threatening the life and food security of 300 million African people (Atera et al., 2012). The germination of *Striga* seed requires favorable hot and humid conditions and most importantly, the perception of host-released chemical signals, such as Strigolactones (Fiorilli et al., 2019). The germinated *Striga* seeds should establish a connection to the root system of the host to survive due to very limited food reserve in tiny seeds for a short period of time (Sibhatu, 2016). This essential step of Striga life cycle leads to a basis for a promising control strategy, known as "Suicidal Germination" (Kountche et al., 2019).

Root parasites (*Striga* spp. and *Orobanche* spp.) and shoot parasites (*Cuscuta* spp., *Viscum* spp. *And Arceuthobium* spp.) are the major threat to agriculture which cause the majority of yield losses (Sarić-Krsmanović, et al., 2020). The economic loss caused by *Striga* amounts to approximately 200 million US dollars per year and increases by 30 million US dollars annually (Rodenburg et al., 2016). The infestation of root parasitic plants is a widespread concern in sub-Saharan Africa, where a 40–100% yield reduction has been reported in fields I infested with root parasites, with an annual loss from rice cultivation estimated at 60–700 million US dollars (Schut et al., 2015). If they are not timely managed, they can induce serious yield losses up to total failure of crop productivity (Samejima and Sugimoto, 2018). *Striga* species from the family *Scrophulariaceae* is one of the most important root parasites which causes serious threat to sorghum (*Sorghum bicolor*), maize (*Zea mays*), rice (*Oryza sativa*), pearl millet (*Pennisetum glaucum*), finger millet (*Eleusine coracana*), cowpea (*Vigna unguiculata*) and sugar cane (*Saccharum officinarum)* production in both tropical and sub-tropical countries in Africa (Haruna et al., 2018).

The weeds are widespread with high rates of infestation across African countries. This is due to the fact that many farmers have limited knowledge about the weed and were therefore indifferent towards its control resulting in increasing weed infestation (Ejeta and Tessema, 2019). Continuous use of susceptible crop varieties without any protective measures causes disastrous levels of heavy infestation, crop failures and buildup of the *Striga* seed reserve in the soil. Considering the destructive effect of this weed infestation to cereal crops production, many studies have been conducted on its management (Mrema et al., 2017). The ability of host and nonhost plant species to stimulate parasite seed germination or inhibit attachment encouraged studies on the possible use of these as catch or trap species to reduce parasite infestation. Stimulants of root

Quick Response Code	Access this article online	
	Website: www.taec.com.my	**DOI:** 10.26480/taec.02.2022.63.70

Cite the Article: Mamudu, A.Y. (2022). Striga Hermonthica Suicidal Germination Activity of Ten Soyabean, Cowpea and Groundnut Varieties in Niger State, Nigeria. *Tropical Agroecosystems, 3(2): 63-70.*

parasites are mainly natural chemicals (Allelochemicals) released through the host's root system into the surrounding environment and received by parasite seeds.

In view of some deficiencies and feasibility limits of *Striga* control methods, a single method might not solve effectively the serious agro-economic problems caused by *Striga* infestation (Marley et al., 2005; De Groote et al., 2008). However, for most African cereal growers, the most appropriate method would be one that uses a simple and inexpensive techniques adapted to their farming system. One such simple yet promising control method is the use of non-hosts or trap crops. These crops have root exudates that stimulate *Striga* seed to germinate but the germinated *Striga* plants cannot parasitize them. Effective *Striga* management cannot be achieved by a single control method and requires the integration of different approaches (Sibhatu, 2016). A cereal-legume crop rotation can be combined with the application of synthetic germination stimulants to deplete accumulated seed bank in infested soils (Kountche et al., 2019). It can be also anticipated that the integration of suicidal germination technology with *Striga*-specific herbicides and/or zaxinone analogs can be very effective in dealing with the *Striga* problem in African agriculture.

2. Materials and Methods

Two years' (2013 and 2014) screen house trials were conducted at Federal University of Technology Research farm Minna, (09° 3'N and 06° 28'E). The soil was a sandy clay loan. *Striga*-free soil was collected and sterilized for two hours, polybags were filled with 20 g of the sterilized soil and then inoculated with *Striga* seeds at three levels inoculation rate (0, 2.5 and 5 g). Ten varieties of either soyabean, cowpea and groundnut as trap crops was used with two sorghum varieties, resistance (ICSV 1002) and susceptible (Local) Varieties. The polybags were watered carefully the first day and later after 5 days in order to condition the *Striga* seeds. The trap crops were sown one week later. After harvesting the trap crops, the two sorghum varieties above were sown, torn polybags at that time were carefully replaced with new one by transferring the old bags into the new ones so as not to loss part of the soil.

The bags were monitored and watered regularly. Sorghum seedlys were thinned down to two per bag. The sorghum varieties were repeatedly sown again the following year as done the previous year. Data were collected on trap crops as follow: Days to first *Striga* emergence, trap crop plant height and dry mass. Data collected on sorghum includes: Days to first *Striga* emergence, trap crop plant height and dry mass. Data collected on sorghum includes: Days to first striga emergence, *Striga* count at 6 and 8 WAS per stand of sorghum, plant height at 10 and 14 WAS, 1000 grain weight and grain yield. Data were subjected to analysis of variance using computer software (Genstat, 2010). Statistically differences between variable means were compared using least significant difference (P < 0.05).

3. Results

The effect of Soyabean varieties in Soyabean response to screening on *Striga hermonthica* shoot emergence were significant (P < 0.05) in 2013 and 2014 planting years. Soyabean TGX 1019-2EB and TGX 1448-2E in 2013 and 2014 respectively delayed *Striga* emergence compared to other varieties (Table 1). Soyabean TGX 1448-2E performed better in striga count, plant height and grain yield in both years. Fewer *Striga* count was recorded at 2.5 g *Striga* level compared to 5 g *Striga* level in all sample periods and planting years. Taller plant height and higher grain yield was observed in 0 g (control) *Striga* level compared to other striga level (Table 1). throughout the years the interaction effect of soyabean varieties and *Striga* level on soyabean response to screening were not significant on *Striga* emergence, *Striga* count and plant height in 2013 and 2014, in all sample periods except plant height at 6 WAS in 2014 where soyabean TGX 1448-2E at 0 g *Striga* level produced higher plant height compared to other varieties (Table 2). Grain yields were significant (P < 0.05) in both years soyabean variety TGX 1448-2E at 0 g *Striga* level recorded highest grain yield compared to other varieties (Table 2).

Table 1: Effect of Soyabean Varieties and *Striga* Levels on Response to Soyabean Screening

Treatments	2013							2014						
Soyabean varieties	**ISSE**	**6SSC**	**8SSC**	**6PH**	**8PH**	**1000GW**	**GY**	**ISSE**	**6 SSC**	**8SSC**	**6PH**	**8PH**	**100GW**	**GY**
TGX1937-1F	56.25	7.40	12.05	23.77	42.03	10.18	265.80	55.99	6.10	12.05	13.30	36.57	9.20	263.16
TGX1986-10F	57.55	6.15	8.90	24.43	42.90	12.90	323.10	57.75	7.25	8.90	24.37	43.73	12.93	322.81
TGX1986-10F	56.20	8.20	13.35	23.80	40.10	9.81	248.00	55.99	7.05	13.35	22.80	35.93	8.28	239.16
TGX1990-45F	56.15	7.05	11.45	24.60	40.30	11.70	315.40	55.99	6.15	11.45	24.03	40.20	11.36	310.76
TGX187-62F	57.40	6.70	10.05	25.10	41.50	11.89	312.20	57.50	12.05	10.05	25.50	41.03	12.01	315.84
TGX1987-96F	56.15	7.25	11.45	24.13	40.23	10.42	316.70	55.99	8.90	11.45	24.23	37.70	9.52	309.97
TGX1448-2E	58.05	3.60	6.35	27.57	44.07	17.18	364.90	59.30	13.35	6.35	29.63	48.47	17.76	368.27
TGX1835-10E	57.70	6.20	7.90	25.40	42.63	13.30	338.60	58.00	11.45	7.90	25.30	44.23	13.68	339.66
TGX1830-20E	58.35	5.25	7.35	26.60	45.00	14.46	343.20	58.95	10.05	7.35	27.67	46.73	14.99	351.64
TGX1019-2EB	58.70	3.85	6.55	27.10	44.93	19.81	356.80	58.30	11.45	6.55	27.87	49.03	15.23	362.02
Mean	57.25	6.17	9.54	25.25	42.37	13.17	318.47	56.78	9.85	9.83	26.30	43.22	12.86	318.33
LSD(P<0.05)	0.47	0.62	0.48	0.93	2.24	3.76	13.69	0.22	0.55	0.48	0.32	1.02	0.44	7.93
***Striga* Level(g)**														
0	00.00	0.00	0.00	26.17	43.39	13.90	306.50	00.00	0.00	0.00	27.09	45.22	13.53	354.14
2.5	57.35	5.33	8.57	25.04	42.65	13.07	312.00	310.08	8.41	8.57	25.12	42.31	12.46	310.08
5	57.15	6.80	10.51	24.54	41.06	14.25	282.90	280.77	10.35	0.26	24.20	39.56	11.50	280.77
Mean	57.25	6.10	9.54	25.25	42.37	13.74	300.47	216.11	9.38	6.12	26.11	42.36	13.00	315.00
LSD) P<0.05)	NS	0.34	0.26	0.51	1.23	NS	7.50	4.34	0.30	0.26	0.18	0.56	0.24	4.34

1SSE = First *Striga* Shoot Emergence, 6SSC= *Striga* Shoot Count at 6 WAS, 8 SSC= *Striga* Shoot Count at 8 WAS, 6 PH. Sorghum Plant Height

Table 2: Interaction Effect of Soyabean Varieties and Striga Levels on Response to Screening

Treatments		2013							2014						
Varieties	***Striga* level (g)**	**ISSE**	**6SSC**	**8SSC**	**6PH**	**8PH**	**1000 GW**	**GY**	**ISSE**	**6 SSC**	**8SSC**	**6PH**	**8PH**	**1000 GW**	**GY**
TGX1937-1F	0	0.00	0.00	0.00	25.20	42.40	10.87	317.40	0.00	0.00	0.00	24.90	39.40	9.47	309.17
	2.5	56.60	6.80	11.10	23.30	42.60	10.35	253.10	56.00	5.20	11.10	22.90	36.40	9.29	253.91
	5	55.90	8.00	13.00	22.80	41.10	9.33	226.80	56.00	7.00	13.00	22.10	33.90	8.84	226.40
TGX1986-10F	0	0.00	0.00	0.00	25.70	44.10	13.89	368.80	0.00	0.00	0.00	26.20	46.30	13.94	369.33
	2.5	57.70	5.30	7.70	24.40	42.00	13.13	319.10	57.70	6.80	7.70	23.80	43.20	12.90	317.58
	5	57.40	7.00	10.10	23.20	42.50	11.70	281.50	57.80	7.70	10.10	23.10	41.70	11.95	281.53
TGX1986-10F	0	0.00	0.00	0.00	24.00	40.40	10.26	256.80	0.00	0.00	0.00	24.20	39.60	8.72	260.75
	2.5	55.90	7.60	12.40	23.50	43.10	9.59	258.50	56.00	5.80	12.40	22.40	36.30	7.95	244.73
	5	56.50	8.80	14.30	23.90	36.80	9.59	228.60	56.00	8.30	14.30	21.80	31.90	8.17	212.01
TGX1990-45F	0	0.00	0.00	0.00	24.80	42.40	11.93	344.90	0.00	0.00	0.00	24.90	42.70	11.95	345.93
	2.5	56.50	6.90	10.50	24.40	39.50	11.77	320.50	56.00	5.30	10.50	24.00	40.20	11.07	307.26
	5	56.10	7.20	12.40	24.60	39.00	11.41	280.90	56.00	7.00	12.40	23.20	37.70	11.07	279.10
TGX187-62F	0	0.00	0.00	0.00	26.50	42.20	12.60	360.40	0.00	0.00	0.00	27.60	43.60	12.62	366.14
	2.5	57.50	6.10	9.00	25.00	41.50	11.51	300.50	57.50	11.10	9.00	25.30	41.30	11.77	305.37
	5	57.30	7.30	11.10	23.80	40.80	11.57	275.50	57.50	13.00	11.10	23.60	38.20	11.63	276.01
TGX1987-96F	0	0.00	0.00	0.00	25.30	41.20	10.39	345.10	0.00	0.00	0.00	26.10	40.10	10.37	330.11
	2.5	56.20	6.50	10.30	24.20	41.30	10.57	321.90	56.00	7.70	10.30	24.10	37.60	9.88	318.71
	5	56.10	8.00	12.60	22.90	38.20	10.31	283.10	56.00	10.10	12.60	22.50	35.40	8.31	281.09
TGX1448-2E	0	0.00	0.00	0.00	28.20	45.80	19.03	414.90	0.00	0.00	0.00	31.70	50.90	19.69	432.11
	2.5	58.30	3.20	5.40	27.10	44.10	17.08	350.60	59.30	12.40	5.40	29.00	49.20	17.86	348.58
	5	57.80	4.00	7.30	27.40	42.30	15.43	329.20	59.30	14.30	7.30	28.20	45.30	15.73	324.13
TGX1835-10E	0	0.00	0.00	0.00	26.60	43.30	14.56	402.80	0.00	0.00	0.00	27.00	47.40	14.92	401.61
	2.5	57.70	5.00	7.50	25.20	42.70	13.06	326.20	58.00	10.50	7.50	24.70	43.40	13.61	324.21
	5	57.70	7.40	8.30	24.40	41.90	12.28	286.80	58.00	12.40	8.30	24.20	41.90	12.50	293.15
TGX1830-20E	0	0.00	0.00	0.00	27.00	44.70	14.56	389.40	0.00	0.00	0.00	28.70	50.20	16.48	405.67
	2.5	58.60	4.60	6.10	26.20	45.90	13.81	327.90	59.00	9.00	6.10	27.10	46.60	14.95	339.14
	5	58.10	5.90	8.60	26.60	44.40	14.25	312.20	58.90	11.10	8.60	27.20	43.40	13.57	310.12
TGX1019-2EB	0	0.00	0.00	0.00	28.40	47.40	14.47	404.90	0.00	0.00	0.00	29.60	52.00	17.10	420.56
	2.5	58.80	3.30	5.70	27.10	43.80	22.11	341.20	59.30	10.30	5.70	27.90	48.90	15.33	341.36
	5	58.60	4.40	7.40	25.80	43.60	22.59	324.30	59.30	12.60	7.40	26.10	46.20	13.23	324.20
			57.26	6.17	9.54	25.25	42.37	13.13	318.46	57.48	9.38	9.54	25.47	42.36	12.50
LSD(P<0.05)		NS	NS	NS	NS	NS	NS	23.72	NS	NS	NS	0.56	NS	0.77	13.74

1SSE = first Striga shoot emergence, 6SSC= Striga shoot count at 6 WAS, 8 SSC= Striga shoot count at 8 WAS, 6 PH. Sorghum plant height at 6 WAS. 8PH= Sorghum plant height at 8 WAS, GW= Grain weight, GY: Grain yield. NS= Not significant

The effect of cowpea Varieties in cowpea response to screening were significant (P < 0.05) in 2013 and 2014 on days to first Striga emergence. Cowpea varieties IT04K-339-1 and IT07K-25-3-3 in 2013 and 2014 respectively delayed Striga emergence compared to other varieties (Table 3). Cowpea variety IT04K-217-5 recorded fewer Striga count, and higher plant height compared to other varieties in both years. But higher grain yield was rather observed in cowpea variety IT04K-339-1 compared to other varieties (Table 3). Striga emergence was earlier at 2.5 g Striga level compared to 5 g Striga level in 2013. But 2014 were not significant. fewer Striga count was seen in 2.5 g compared to 5 g Striga level in all the planting years. Taller height and higher grain yield was recorded at 0 g (control) Striga level compared to 2.5 and 5 g Striga level (Table 3). The interaction effect of cowpea varieties and Striga level on cowpea response to screening were significant (P < 0.05) in 2013, cowpea variety IT04K-333-2 delayed Striga emergence at 5 g Striga level compared to other varieties and Striga level. But 2014 where not significant (Table 4) .Cowpea variety IT04K-217-5 at 2.5 g Striga level performed better than other varieties. Plant height was not significant in 2013, but 2014 was, at 8 WAS, variety IT04K-217-5 at 0 g Striga level produced taller plant height than other varieties (Table 4). The variety IT04K-217-5 also produced higher grain yield in both years compared to other varieties.

Table 3: Effect of Cowpea Varieties and *Striga* Levels on Response to Cowpea Screening

Treatment	**2013**							**2014**						
Cowpea varieties	ISSE	6SSC	8SSC	6PH	8PH	1000GW	GY	**ISSE**	**6 SSC**	**8SSC**	**6PH**	**8PH**	**100GW**	**GY**
IT04K-217-5	56.55	4.36	5.75	27.07	45.90	25.14	468.30	56.5	3.4	5.5	27.57	46.27	25.35	469.28
IT04K-227-4	55.76	5.18	9.40	25.40	44.80	21.04	438.70	55	6.75	9.3	24.87	43.33	20.54	440.75
IT07K-210-1	56.11	7.26	12.75	25.80	43.30	20.58	431.20	55.45	8.85	12.7	25.07	41.17	19.04	242.83
IT07K-25-3-3	56.76	5.71	6.30	26.93	45.30	23.82	450.50	56.75	3.8	6.15	26.67	46	23.79	451.27
IT07K-237.2-1	55.71	5.81	12.25	25.87	44.60	21.29	447.00	55.5	6.8	12.25	24.03	40.4	17.37	423.71
IT04K-333-2	57.06	4.63	8.30	25.87	44.60	21.29	447.00	56.5	5.15	8.1	25.63	43.93	21.24	449.05
IT04K-339-1	56.81	5.06	7.50	26.27	44.70	22.09	484.30	56.7	4.99	7.55	26.3	44.43	21.84	494.58
IT04K-405-5	56.21	6.36	12.00	24.63	44.00	18.33	411.00	55.5	7.9	11.95	22.33	40.67	17.37	399.86
IT07K-293-3	56.51	6.36	11.90	24.60	43.70	20.33	433.40	56	7.8	12	24	42.13	20.03	431.21
IT07K-318-2	56.21	6.66	12.50	24.60	43.10	17.75	391.10	55.5	8.45	12.75	22.23	39.27	16.79	376.05
Mean	56.37	5.74	9.87	25.70	44.40	21.17	440.25	55.94	6.39	9.83	24.87	42.76	20.34	417.86
LSD)P<0.05)	0.47	0.67	0.53	1.39	NS	0.79	9.98	0.40	0.32	0.44	0.50	0.76	0.31	5.81
***Striga* level (g)**														
0	0.00	0.00	0.00	26.75	45.70	21.60	464.00	0.00	0.00	0.00	27.54	46.43	21.24	465.44
2.5	56.14	6.28	8.98	25.61	44.20	20.78	433.10	56.0	5.9	8.96	24.6	42.4	20.21	431.25
5	56.37	7.09	10.75	24.69	46.70	20.28	418.60	55.5	6.88	10.69	22.47	39.45	19.57	411.48
Mean	56.37	5.73	9.87	25.68	45.53	20.89	438.57	37.17	4.26	6.55	24.87	42.76	20.34	436.06
LSD)P<0.05)	0.26	0.36	0.29	0.76	NS	0.43	5.47	NS	0.17	0.24	0.28	0.42	0.17	3.18

1SSE = first Striga shoot emergence, 6SSC= Striga shoot count at 6 WAS, 8 SSC= Striga shoot count at 8 WAS,

6 PH. Sorghum plant height at 6 WAS. 8PH= Sorghum plant height at 8 WAS, GW= Grain weight, GY: Grain yield. NS= Not significant

Table 4: Interaction Effect of Cowpea Varieties and Striga Levels on Response to Cowpea Screening

Treatments		2013							2014						
Cowpea Varieties	***Striga* Level (g)**	**ISSE**	**6SSC**	**8SSC**	**6PH**	**8PH**	**1000 GW**	**GY**	**ISSE**	**6 SSC**	**8SSC**	**6PH**	**8PH**	**1000GW**	**GY**
IT04K-217-5	0	0.00	0.00	0.00	26.60	47.20	25.85	531.50	0.00	0.00	0.00	30.40	50.50	26.20	535.13
	2.5	56.60	5.70	5.20	27.70	46.10	24.96	442.90	56.50	2.80	4.90	27.30	46.70	25.20	442.88
	5	56.80	4.90	6.30	26.90	44.50	24.61	430.40	56.50	4.00	6.10	25.00	41.60	24.67	429.83
IT04K-227-4	0	0.00	0.00	0.00	27.90	45.80	21.95	449.70	0.00	0.00	0.00	28.00	47.10	21.18	458.36
	2.5	55.30	6.20	8.20	24.60	44.20	21.14	438.70	55.00	5.70	8.10	24.40	42.60	20.63	443.37
	5	56.00	8.20	10.60	23.70	44.50	20.05	427.70	55.00	7.80	10.50	22.20	40.30	19.83	420.53
IT07K-210-1	0	0.00	0.00	0.00	26.90	45.20	20.79	455.00	0.00	0.00	0.00	27.40	45.10	19.84	448.09
	2.5	56.00	7.60	11.80	25.50	43.60	20.33	423.30	55.50	8.20	11.80	24.50	40.30	19.13	419.23
	5	56.00	8.80	13.70	25.00	41.00	20.62	415.30	55.40	9.50	13.60	23.30	38.10	18.16	407.17
IT07K-25-3-3	0	0.00	0.00	0.00	28.30	47.20	24.61	506.30	0.00	0.00	0.00	29.30	50.10	24.69	515.20
	2.5	56.50	4.50	5.80	27.00	45.60	24.61	431.00	56.80	3.50	5.60	26.50	46.40	23.87	420.61
	5	56.80	5.60	6.80	25.50	43.20	22.64	414.20	56.70	4.10	6.70	24.20	41.50	22.81	408.00
IT07K-237.2-1	0	0.00	0.00	0.00	26.20	45.00	19.27	442.20	0.00	0.00	0.00	26.10	44.60	18.26	439.02
	2.5	55.60	6.40	10.80	25.20	42.70	18.13	424.00	55.50	6.20	10.70	23.80	40.30	17.34	422.54
	5	55.60	7.10	13.70	25.60	79.40	18.12	462.60	55.50	7.40	13.80	22.20	36.30	16.51	409.59
IT04K-333-2	0	0.00	0.00	0.00	26.50	45.60	21.88	462.60	0.00	0.00	0.00	28.70	47.10	22.25	472.93
	2.5	56.30	6.20	7.80	26.20	44.70	21.88	462.60	56.50	5.10	7.70	25.40	43.20	20.93	448.84
	5	57.00	6.10	8.80	24.90	43.60	20.86	430.50	56.50	5.20	8.50	22.80	41.50	20.56	425.38
IT04K-339-1	0	0.00	0.00	0.00	27.30	46.40	22.38	498.10	0.00	0.00	0.00	29.00	48.20	22.63	505.42
	2.5	56.70	5.30	7.30	25.80	44.10	21.97	487.30	56.70	4.30	7.30	26.10	43.70	21.54	499.77
	5	56.70	6.70	7.70	25.70	43.50	21.92	467.50	56.70	5.70	7.80	23.80	41.40	21.36	478.54
IT04K-405-5	0	0.00	0.00	0.00	25.70	44.80	19.85	439.80	0.00	0.00	0.00	25.10	43.40	18.59	425.05
	2.5	55.90	6.70	11.00	24.90	43.90	17.90	401.80	55.50	7.30	10.90	22.40	40.20	17.23	394.89
	5	56.30	7.90	13.00	23.30	43.30	17.24	391.30	55.50	8.50	13.00	19.50	38.40	16.31	379.66
IT07K-293-3	0	0.00	0.00	0.00	25.80	45.20	20.94	445.90	0.00	0.00	0.00	26.60	45.90	21.03	451.83
	2.5	56.80	7.20	10.50	24.80	43.50	20.05	435.00	56.00	8.10	10.80	23.70	41.50	19.72	428.92
	5	56.00	7.40	13.00	23.20	42.40	20.01	419.20	56.00	7.50	13.20	21.70	39.00	19.33	412.88
IT07K-318-2	0	0.00	0.00	0.00	26.30	44.10	18.45	409.20	0.00	0.00	0.00	24.80	42.30	17.74	403.41
	2.5	55.70	7.00	11.40	24.40	43.30	18.02	398.50	55.50	7.80	11.80	21.90	39.10	16.47	381.49
	5	56.50	8.20	13.60	23.10	42.00	16.76	365.50	55.50	9.10	13.70	20.00	36.40	16.15	343.26
Mean		56.37	5.74	9.85	25.68	45.52	20.93	440.32	55.94	6.39	9.83	24.87	42.76	20.34	435.73
LSD(P<0.05)		0.82	1.15	0.93	NS	NS	NS	17.29	NS	0.55	0.76	NS	1.32	NS	10.06

1SSE = first Striga shoot emergence, 6SSC= Striga shoot count at 6 WAS, 8 SSC= Strigs shoot count at 8 WAS, 6 PH. Sorghum plant height at 6 WAS. 8PH= Sorghum plant height at 8 WAS, GW= Grain weight, GY: Grain yield. NS= Not significant

The effect of groundnut varieties in groundnut response to screening was significant (P < 0.05) in 2014, groundnut varieties TES, QH243C, RMP-12 and RMP-91. Delayed Striga emergence compared to other varieties (Table 5). Fewer Striga count and higher plant height and higher grain yield were recorded in variety RMP-91 in both years compared to other varieties (Table 5). The interaction effect of groundnut varieties and Striga level on groundnut response to screening was significant (P < 0.05) in 2014, RMP-91 at both Striga level 2.5 and 5 g delayed Striga emergence, though varieties QH243C and TES at 2.5 and 5g Striga level also do the same. 2013 were not significantly different (Table 6). Fewer Striga count and taller plant height were recorded in variety RMP-91 at 2.5 g and 0 g respectively, variety RMP-12 also recorded taller height at 0 g Striga level compared to other varieties higher grain yield was recorded in RMP-91 at 0 g Striga level in both years (Table 6).

Table 5: Effect of Groundnut Varieties and Striga Levels on Response to Groundnut Screening

Treatments	**2013**							**2014**						
Groundnut Varieties	**ISSE**	**6SSC**	**8SSC**	**6PH**	**8PH**	**1000 GW**	**GY**	**ISSE**	**6 SSC**	**8SSC**	**6PH**	**8PH**	**1000 GW**	**GY**
TE3	37.80	4.37	6.93	23.93	45.07	31.70	491.43	37.67	4.00	6.80	24.43	44.33	31.40	490.22
CHICO	38.93	5.80	8.80	23.70	44.47	31.70	462.32	36.97	5.77	8.87	23.80	43.23	31.07	461.37
KH 241D	37.07	6.00	9.07	22.93	43.73	30.90	441.52	37.00	6.10	9.23	22.20	42.00	29.47	440.42
QH 243C	37.60	5.13	7.90	24.43	43.97	32.13	474.36	37.67	5.03	7.77	24.97	43.93	31.13	475.38
CN 94C	37.17	5.77	9.20	23.83	43.00	30.40	452.80	37.00	5.83	9.20	23.70	42.20	28.87	451.38
RRB	37.10	5.03	9.57	23.10	42.27	29.90	430.89	37.00	3.20	9.90	22.67	40.83	28.37	428.71
RMP-12	37.63	4.10	6.10	24.50	45.47	31.87	487.67	37.67	3.90	6.27	25.63	44.80	30.77	487.97
RMp-91	37.70	3.53	5.53	25.50	46.50	31.87	495.25	37.67	3.00	5.40	25.83	46.50	31.23	494.22
Groundnut-23	36.90	5.37	8.23	24.40	44.63	32.50	470.09	36.67	5.33	7.90	24.20	43.30	32.20	469.67
Groundnut-11	37.07	6.50	9.10	22.17	42.57	29.00	430.69	37.00	7.17	9.17	21.73	40.53	26.57	430.09
Mean	37.50	5.16	8.04	23.85	44.17	31.20	463.70	37.23	4.93	8.05	23.92	43.17	30.11	462.94
LSD(P<0.05)	NS	0.56	0.47	0.85	1.06	0.96	5.12	0.03	0.31	0.27	0.51	0.53	0.38	4.27
***Striga* Level (g)**														
0	0.00	0.00	0.00	25.36	45.56	32.05	474.16	0.00	0.00	0.00	26.36	45.40	31.45	474.09
2.5	55.99	6.88	11.27	23.83	43.98	31.15	462.06	55.84	6.53	11.23	23.77	42.84	29.94	461.16
5	55.94	8.60	12.86	22.36	42.96	30.38	454.89	55.85	8.93	12.92	21.62	41.26	28.93	453.60
Mean	37.50	5.16	8.04	23.85	44.17	31.19	463.70	37.23	5.15	8.05	23.92	43.17	30.11	462.95
LSD(P<0.05)	0.19	0.31	0.26	0.47	0.58	0.53	2.81	0.02	0.17	0.15	0.28	0.29	0.21	2.34

1SSE = first Striga shoot emergence, 6SSC= Striga shoot count at 6 WAS, 8 SSC= Strigs shoot count at 8 WAS, 6 PH. Sorghum plant height at 6 WAS. 8PH= Sorghum plant height at 8 WAS, GW= Grain weight, GY: Grain yield. NS= Not significant

Table 6: Interaction Effect of Groundnut Varieties and Striga Levels on Response to Groundnut Screening

Treatments		**2013**							**2014**						
Groundnut Varieties	***Striga* Level (g)**	**ISSE**	**6SSC**	**8SSC**	**6PH**	**8PH**	**1000 GW**	**GY**	**ISSE**	**6SSC**	**8SSC**	**6PH**	**8PH**	**1000 GW**	**GY**
TE3	0	0.00	0.00	0.00	26.20	45.70	32.00	501.70	0.00	0.00	0.00	28.00	46.80	32.90	501.07
	2.5	56.50	6.40	9.10	24.00	45.40	32.00	491.18	56.60	5.20	9.00	24.20	44.30	31.20	490.05
	5	59.90	6.70	11.70	21.60	44.10	31.10	481.40	56.00	6.80	11.40	21.10	41.90	30.10	479.53
CHICO	0	5.60	0.00	0.00	25.70	45.80	32.30	465.99	0.00	0.00	0.00	26.40	45.30	32.40	464.32
	2.5	55.60	8.20	12.20	23.70	44.30	31.60	462.45	55.40	7.50	12.56	23.70	43.30	30.80	461.88
	5	55.60	9.20	14.20	21.70	43.30	31.20	456.50	55.50	9.80	14.20	21.30	41.10	30.00	457.90
KH 241D	0	0.00	0.00	0.00	24.30	45.80	31.20	458.50	0.00	0.00	0.00	24.50	43.80	29.80	445.12
	2.5	55.70	7.70	13.60	22.80	43.30	31.00	445.76	55.50	7.70	13.50	22.20	41.70	29.20	439.32
	5	55.50	10.30	13.60	22.80	43.30	31.00	440.91	55.50	10.60	14.20	19.90	40.50	29.40	436.80
QH 243C	0	0.00	0.00	0.00	26.40	45.00	32.60	481.97	0.00	0.00	0.00	27.90	46.30	32.30	487.79
	2.5	56.60	7.20	11.10	24.10	44.00	31.90	472.92	56.50	6.60	10.80	24.70	43.40	30.90	471.39
	5	56.20	8.20	12.60	22.80	42.90	31.90	468.20	56.50	8.50	12.50	22.50	42.10	30.20	467.13
CN 94C	0	0.00	0.00	0.00	25.00	43.90	31.00	461.26	0.00	0.00	0.00	25.90	43.90	29.70	457.97
	2.5	55.50	7.20	13.20	24.00	42.80	30.40	448.75	55.50	7.10	13.20	23.80	42.00	29.00	448.41
	5	56.00	10.10	14.40	22.50	42.30	29.80	448.40	55.50	10.40	14.40	21.40	40.70	27.90	447.95
RRB	0	0.00	0.00	0.00	23.90	43.80	31.00	437.05	0.00	0.00	0.00	24.60	43.00	29.80	437.05
	2.5	55.90	6.60	13.70	23.20	41.80	29.80	428.37	55.50	6.60	14.30	22.30	39.80	28.30	428.35
	5	55.40	8.50	15.00	22.20	41.20	28.90	427.25	55.50	9.00	15.40	21.10	39.70	27.00	420.72
RMP-12	0	0.00	0.00	0.00	25.40	48.00	33.30	509.15	0.00	0.00	0.00	28.00	48.20	32.70	508.80
	2.5	56.60	5.60	8.20	24.70	45.00	31.50	486.15	56.50	4.80	8.40	25.50	44.50	30.30	487.21
	5	56.30	6.70	10.10	23.40	43.40	30.80	467.72	56.50	6.90	10.40	23.30	41.70	29.30	467.90
RMp-91	0	0.00	0.00	0.00	26.60	48.20	33.30	513.72	0.00	0.00	0.00	28.10	49.00	33.20	514.83
	2.5	56.40	4.50	6.80	25.50	46.30	31.70	495.29	56.50	3.50	6.70	25.70	46.10	31.00	491.08
	5	56.70	6.10	9.80	24.40	45.00	30.50	476.74	56.50	5.50	9.50	23.70	44.40	29.50	476.74
Groundnut-23	0	0.00	0.00	0.00	26.00	45.90	33.10	478.60	0.00	0.00	0.00	26.40	45.80	33.20	478.60
	2.5	55.60	7.10	11.30	24.40	44.60	32.30	468.67	55.00	6.90	10.60	24.10	42.90	32.20	467.94
	5	55.10	9.00	13.40	22.80	43.40	32.10	463.00	55.00	9.70	13.10	22.10	41.20	31.20	462.47
Groundnut-11	0	0.00	0.00	0.00	24.10	43.50	30.90	446.36	0.00	0.00	0.00	23.90	41.90	28.50	445.35
	2.5	55.50	8.30	13.50	21.90	42.30	29.30	425.92	55.50	9.40	13.40	21.50	40.40	26.50	425.91
	5	55.70	11.20	13.80	20.50	41.90	26.80	419.80	55.00	12.10	14.10	19.80	39.30	24.70	419.00
		37.60	5.16	8.04	23.89	44.21	31.21	464.32	37.20	5.15	8.06	23.92	43.17	30.11	462.95
LSD (P<0.05)		NS	0.98	0.81	NS	NS	NS	8.87	0.05	0.54	0.46	0.88	0.91	0.66	7.40

1SSE:= first Striga shoot emergence, 6SSC= Striga shoot count at 6 WAS, 8 SSC= Striga shoot count at 8 WAS, 6 PH. Sorghum plant height at 6 WAS. 8PH= Sorghum plant height at 8 WAS, GW= Grain weight, GY: Grain yield. NS= Not significant.

4. Discussion

4.1 Striga Emergence

The ability of soyabean varieties TGX 1019-2EG and TGX1448-2E, Cowpea varieties IT04K-333-2 and IT07K-25-3-3 and groundnut varieties RMP-91, RMP-12, TES and QH343C to hinder early *Striga* emergence compared to other varieties could be ability of some of these legumes to produces a radical growth inhibition chemical in addition to the germination-stimulating chemical which is found in them. This hinders the attachment of the parasite radicle onto the sorghum host plant this is in consonant with the findings of who observed that in addition to the germination-stimulating chemical, Desmodium also produces a radicle growth inhibition chemical, which hinders the attachment of the parasite radicle onto the associated maize host plant (Tsanuo et al., 2003).

4.2 Striga Count

Fewer *Striga* count on soyabean varieties TGX 1990-4F and TGX 1448-2E, cowpea variety IT04K-217-5 and groundnut variety RMP-91 could be attributed to the germination and dead of some of the *Striga* seeds in the absence of the host which is more fatal in these trap crop varieties compared to other varieties used. This in agreement with the findings of that trap crops varied in their *Striga* stimulation potential, some had high stimulation while others had medium or low stimulation (Botanga et al., 2003).

4.3 Plant Height

The result of this study on sorghum plant height indicate that higher plant height observed in soyabean varieties TGX 1448-2E, TGX 1830-20E and TGX 1019-2EB, cowpea varieties IT07K-25-3-3 and IT04K-217-5 and groundnut variety RMP-91 might be due to inability of the fewer *Striga* shoot to have effects on the host cell elongation as it could not take photosynthetic away from the host crop which could have head to shorter host internodes and stunted growth. This confirm that possible reduction in photosynthetic activity as well as competition for growth resources could lead to reduced plant height and yield (Press et al., 1989).

4.4 Grain Yield

The relatively high yield recorded by soyabean variety TGX 1448-2E, cowpea Variety IT04K-339-1 and groundnut variety RMP-91 when compared to other varieties each confirmed the ability of these varieties to reduce *Striga* attachment and its subsequent effect on the host plant resulting in good host development and growth. A group researcher earlier reported that parasitic weed competes for water and nutrients as a root parasite and in so doing crop growth is stunted and yield are generally reduced (Ayongwa et al., 2010).

5. Conclusion

There was efficient stimulation of germination of *S. hermonthica* seeds by soyabean TGX 1448-2E, cowpea IT04K-339-1 and groundnut RMP-91, these could be strongly recommended for sowing in *Striga* – infested field under crop rotation or intercropping system for enhanced crop yield.

References

Atera, E.A., Itoh, K., Azuma, T., and Ishii, T., 2012. Response of NERICA rice to Striga hermonthica infections in Western Kenya. International Journal of Agriculture and Biology, 14, Pp. 271-275.

Ayongwa, G., Stomph, T., Hoevers, R., Ngoumou, T., Kuyper, T., 2010. Striga infestation in northern Cameroon: Magnitude, dynamics, and implications for management. NJAS-Wagen J. Life Sci., 57, Pp. 159–165.

Botanga, C.J., Alabi, S.O., Echekwu, C.A., Lagoke, S.T.O., 2003. Genetics of suicidal germination of Striga hermonthica (Del.) Benth by cotton. Crop Science, 43, Pp. 483-488.

De Groote, H., Wangare, L., Kanampiu, F., Odendo, M., Diallo, A., Karaya, H., and Friesen, D., 2008. The potential of a herbicide resistant maize technology for Striga control in Africa. Agric. Syst., 97, Pp. 83-94.

Ejeta, G., and Tessema, T., 2019. Sorghum Production in Transition Through Striga Management.

Fiorilli, V., Wang, J.Y., Bonfante, P., Lanfranco, L., Al-Babili, S., 2019. Apocarotenoids: Old and New Mediators of the Arbuscular\Mycorrhizal Symbiosis. Front. Plant Sci., 10, Pp. 1186.

Haruna, P., 2018. Farmers and Agricultural Extension Officers Perception of Striga gesnerioides (Willd.) Vatke Parasitism on Cowpea in the Upper East Region of Ghana. Advances in Agriculture.

Jamil, M., Kountche, B.A., and Al-Babili, S., 2021. Current progress in Striga management. Plant physiology, 185 (4), Pp. 1339-1352.

Kountche, B.A., Jamil, M., Yonli, D., Nikiema, M.P., Blanco-Ania, D., Asami, T., Zwanenburg B., Al-Babili, S., 2019. Suicidal germination as a control strategy for Striga hermonthica (Benth.) in smallholderfarms of sub-Saharan Africa. Plants People Planet, 1, Pp. 107–118.

Marley, P.S., Kroschel, J., and Elzein, A., 2005. Host specificity of Fusarium oxysporum schlect (isolate PSM 197), a potential mycoherbicide for controlling Striga sp. in West Africa. Weed Res., 45, Pp. 407-412.

Mrema, E., 2017. Screening of sorghum genotypes for resistance to Striga hermonthica and S. asiatica and compatibility with Fusarium oxysporum f. sp. strigae. Acta Agriculturae Scandinavica, Section B—Soil & Plant Science, 67 (5), Pp. 395-404.

Press, M.C., Nour, J.J., Bebawi, F.F., and Stewart, G.R., 1989. Antitranspirant-included heat stress in the parasitic plant-a novel method of control. J. Exp. Bot., 40, Pp. 585-591.

Rodenburg, J., Demont, M., Zwart, S.J., Bastiaans, L., 2016. Parasitic weed incidence and related economic losses in rice in Africa. Agric Ecosyst Environ., 235, Pp. 306–317.

Samejima, H., and Sugimoto, Y., 2018. Recent research progress in combatting root parasitic weeds. Biotechnology & Biotechnological Equipment, 32 (2), Pp. 221-240.

Sarić-Krsmanović, M., 2020. Infestation of Field Dodder (Cuscuta campestris Yunck.) Promotes Changes in Host Dry Weight and Essential Oil Production in Two Aromatic Plants, Peppermint and Chamomile. Plants, 9 (10), Pp. 1286.

Schut, M., Rodenburg, J., Klerkx, L., Hinnou, L.C., Kayeke, J., Bastiaans, L., 2015. Participatory appraisal of institutional and political constraints and opportunities for innovation to address parasitic weeds in rice. Crop Prot, 74, Pp. 158–170.

Sibhatu, B., 2016. Review on Striga Weed Management. Int. J. Life Sci. Sci. Res., 2, Pp. 110–120