Striga research activities in Central, Eastern, Lake and Southern Highlands Zones of Tanzania on Station and on-farm trials for 2000/2001 season.

Technical Report 2001

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Preface:

Striga species, the so-called witchweed, are widespread on the fields of smallholder farmers in semi-arid areas of Eastern and Southern Africa. These noxious parasitic weeds principally attack and reduce the yield of finger millet, maize, sorghum and upland rice in these regions. In many areas it is the crops of resource-poor households, which are affected by these weeds. They impose an additional stress with which people, who have little capacity for investment in crop production, have to cope in an environment characterized by marginal rainfall for cropping and declining soil fertility. Since 1996 staff from the Division Agriculture Research Development and, Sokoine University Agriculture (SUA) Tanzania and, Natural Resources Institute and University of Sheffield in UK have been collaborating in studies aimed at developing integrated Striga management practices. Studies are being undertaken on-station and on infested farmers fields in affected communities in the Central, Eastern, Lake and Southern Highlands agricultural zones in Tanzania, with laboratory studies at the University of Sheffield. On-farm studies are implemented in collaboration with District Agricultural Extension. Current work emphasizes:

- the farmer assessment of resistant/tolerant sorghum cultivars and cultural practices, which reduce the impact of parasite.
- the development of learning tools which can provide farmers with a greater understanding of the Striga problem.
- understanding the differential performance of sorghum cultivars under a range of levels of soil fertility;
- the identification of traits which confer tolerance to the parasite in maize;
- farmer's assessment of cultural practices, which reduce the impact of Striga in upland rice.

Working papers are being produced with the aim of providing preliminary results in order to encourage discussion and shape further activities. The following papers summarizing previous results are obtainable from:

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Striga distribution and management in Tanzania- Proceedings of stakeholder workshop (1999) Riches, C.R. (editor)

Integrated Striga control in cereals for small-scale farmers in Tanzania. Project Technical Report (2000) Mbwaga, A.M.

Striga research activities in Dodoma region: Evaluation of on-farm research trials 2000/2001 season (2001) Lamboll, R., Hella, J. Mbwaga, A.M. and Riches, C.

Integrated Management of Striga species on cereal crops in Tanzania: Preliminary study of farmer perceptions of soil resources in Central, Lake and Eastern Zones. (2000) Lamboll, R., Hella, J., Riches, C. Mbwaga, A.M. and G.Ley

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1. Multi-location evaluation of promising sorghum cultivars for Striga resistance and grain yield 2000/2001:

Introduction:

Striga is one of the major constraints to cereal production in the country. Prevailing drought condition, low soil fertility and increased production pressure have led to the introduction and intensive mono-cropping of new genotypes which are very susceptible to Striga. Striga species are obligate root hemi-parasites of cereals and legumes meaning that Striga plants are only partially parasitic with their own chlorophyll and photosynthesis, but the plant cannot establish and develop independently. *Striga asiatica*, *S. hermonthica* and *S. forbesii* are the most economically important and damaging species found in Tanzania. The most widely spread species is *S. asiatica* covering almost three quarters of the country from lake Victoria in the North West to Ruvuma region in the south, and also along the coastal regions from Tanga to Mtwara region in the south. The predominant Striga species in the Northwestern Tanzania around the lake Victoria is *S. hermonthica*. It overlaps with *S asiatica* in Shinyanga, Mwanza and northern Tabora regions. *S. forbesii* has so far been observed in Morogoro, Coast and Mbeya (Kyela) regions (Mbwaga 1996, Mbwaga 2000)
Grain yield loss from parasitised cereal crops is difficult to estimate with any reliability due to variation in soil fertility, infestation levels and tolerance of local varieties however yield loss of up to 90% on heavily infested farmers fields has been reported (Mbwaga 2001). Other consequences of Striga infestation include farm abandonment, now difficult in the face of a shortage of arable land, or change of cropping pattern to less favored, crop resistant cultivars. Reichmann et al (1995) reported that 75% of farmers interviewed in Shinyanga region of Tanzania considered Striga an increasing problem on sorghum, on which they were unable to obtain satisfactory advice from extension staff on effective control options.

From farmer's point of view, host plant resistance offers a cheap and effective method of Striga control.
Starting late 1996, the DFID through Crop Protection Programme and the government of Tanzania have funded this project. Following an initial three-year project, a second phase (CPP project R7564) started in April 2001.In the first phase Striga resistant varieties P9405 and P9406 were identified and they are being tested multi-location on Striga hot spots. Testing for effect of fertilizer urea on Striga infestation and grain yield of rice 50 kg N/ha gives the best control of Striga but due to economic scale farmers have opted on the use of Crotalaria, which has almost equal performance as 50 kg N/ha.

This study was therefore continued to evaluate of promising sorghum varieties for Striga resistance at parasite hot spots at station and on-farm and the use of fertilizer-urea on rice.

Materials and Methods:

Sorghum lines P9405 and P9406 obtained from Purdue University in the USA, SRN 39 from Sudan, commercially released lines Pato and Macia and the local landrace Weijita from Mara were evaluated for Striga resistance at *S. asiatica*, *S. hermonthica* and *S. forbesii* hot spots. The locations were Melela hot spot for *S. asiatica* and *S. forbesii*, Hombolo a hot spot for *S. asiatica* and Ukiriguru a hot

spot for *S. hermonthica* and *S. asiatica*. Ilonga, free from Striga was included to evaluate the yield performance of these materials on plots with no Striga infestation.
The entries were planted at plots of four rows replicated four times. Striga counts were taken from two center rows at 9th and 12th Week after planting and at harvest. Sorghum grain yield and other parameters were also recorded from the two center rows. Farmer’s assessment was also conducted during the season. Data obtained were subjected to statistical analysis.

Results and discussions:

The performance of the sorghum lines at Melela, a hot spot for *S. asiatica* and *S. forbesii*, P9405 and P9406 were observed to support lower Striga

numbers and the difference compared to the susceptible check Pato was statistically significant. The grain yield of the two lines was statistically higher than that of Pato. The lowest grain yield at this location was observed from sorghum cultivar SRN 39 released in Sudan to be resistant to *S. hermonthica*. High plant lodging was counted from Weijita. This line has been reported by farmers in Mara to be highly tolerant to Striga but its problem is lodging. at maturity before harvest due to its weak stem.
The two sorghum lines P405 and P9406 exhibited the same trend at Hombolo, a hot spot for *S. asiatica*. At both dates of counting 12WAP and at harvest the two cultivars had the lowest Striga count when compared to the check Pato and the difference was statistically significant at both stages of Striga count. Relative high grain yield was obtained from the two sorghum cultivars (Table 2) followed by Macia and the lowest was obtained from susceptible check Pato.
At Ukiriguru, a hot spot for *S. hermonthica* and *S. asiatica*, lower Striga numbers were observed from P9405, P9406 and Macia and compared to the susceptible check the difference was statistically significant at $p \leq 0.05$ (Table 3) The yields were not recorded because the crop was affected by terminal drought and outbreak of insect pests at grain filling. Hence only stover weight was recorded and from this P9405 had the highest stover weight.
When the two sorghum lines were evaluated at fields free of Striga (Ilonga), the grain yields of P9405 and P9406 were observed to be lower than the susceptible check Pato by 54.5 and 29.5% respectively. Under stress and Striga infestation the two cultivars out-yielded the released variety Pato but under good environmental conditions they yield less than the released variety. The two types of sorghum have an extra advantage over Pato that they are resistant to leaf blight disease, which severely affected the Pato production in Singida during the 2000/2001 growing season. During the general discussion with farmers, P9405 and P9406 were scored highly for drought and Striga resistance, and early early maturity.

Conclusion:

Under high Striga infestation and prevailing dry conditions the sorghum lines P9405 and P9406 are recommended due to their resistance to Striga and early maturity. P9405 and P9406 were scored highly by farmers for drought and Striga resistance, early maturity and marketability of seed.
These lines will be tabled for release at Seed Release Committee in November 2002.

Table 1.1: On Station evaluation of promising sorghum cultivars for Striga resistance and grain yield, Melela 2000/2001:

Sorghum Entry	Stand count/7.5 m^2	Striga count 9WAP/7.5m^2		Striga count 12WAP/7.5m^2		Leaf Blight Score (1-5)	Zonate leaf spot score (1-5)	Plant height (cm)	% Lodging	Yield (t/ha)
		S. asiatica	*S. forbesii*	*S. asiatica*	*S. forbesii*					
P9405	**51**	**1.3**	**3.3**	**2.3**	**3.3**	**1.0**	**2.3**	**148**	**0**	**1.9a**
P9406	**51**	**0.8**	**0.8**	**3.5**	**4.3**	**1.0**	**2.0**	**127**	**0**	**2.0a**
Weijita	57	74.0	28.3	218.5	61.5	1.0	2.0	242	19	1.2b
Macia	59	44.3	20.0	263.0	83.3	1.0	2.3	139	8	1.1b
SRN 39	61	12.3	24.0	111.3	107.5	1.0	3.0	170	2	0.9b
Pato	61	67.8	34.3	243.5	75.3	1.3	2.5	182	4	1.4ab
Mean	**56.5**	**33.38**	**18.42**	**140.5**	**55.83**	**1.04**	**2.33**	**168.0**	**5.5**	**1.39**
S.E	**2.5**	**9.87**	**4.06**	**31.56**	**11.77**	**0.04**	**0.13**	**8.17**	**1.68**	**0.12**
$P \leq 0.05$		s	S	S	s	ns	s	s	s	s

Means followed by different letters are statistically different from each other ($p \leq 0.05$) according to Duncan New Multiple Range test

Table: 1.2 On station evaluation of promising sorghum cultivars for *Striga asiatica* resistance and grain yield, Hombolo 2000/2001

Test entries	**Stand count**	**Striga count at 12WAP/7.5m^2**	**Striga count at harvest/7.5m^2**	**Plant height (cm)**	**Grain yield (kg/ha)**
P9405	41	1.0	2.0	89	453a
P9406	43	1.3	7.5	78	400ab
Weijita	43	2.0	12.0	100	147d
SRN 39	44	1.0	23.8	97	180bc
Macia	44	2.3	19.0	79	367bc
Pato	55	18.5	92.3	53	107cd
Mean	**44.8**	**4.3**	**26.08**	**82.5**	**276.0**
SE	**1.5**	**2.2**	**8.14**	**7.75**	**3.8**

Means followed by different letters are statistically different from each other ($p \leq 0.05$) according to Duncan New Multiple Range test

Table 1.3: On-station evaluation of promising sorghum cultivars for Striga resistance and grain yield, Ukiriguru 2000/2001:

Test entries	**Stand count**	**Striga count 9WAP/7.5m^2**		**Striga count 12WAP/7.5m^2**		**Striga count at harvest/7.5m^2**		**Leaf blight score scale 1-5**	**Stover weight (kg/ha)**
		S. hermonthica	***S. asiatica***	***S. hermonthica***	***S. asiatica***	***S. hermonthica***	***S. asiatica***		
P9405	**51**	**0.5**	**0**	**9.8**	**0.0**	**36.5a**	**2.0**	**1.7**	**766.7b**
P9406	45	0.0	0	10.8	0.0	32.8a	0.0a	2.1	566.7ab
Weijita	56	0.0	0	3.5	0.3	65.3b	2.0ab	2.1	650.0ab
Macia	49	0.3	0	4.8	0.0	35.5a	11.3b	1.9	450.0ab
SRN 39	42	0.3	0	4.0	0.0	43.3ab	2.5ab	3.3	683.3ab
Pato	52	0.5	0	12.5	1.5	41.8ab	3.5ab	3.7	300.0a
Mean	**49.0**	**0.25**	**0**	**7.54**		**42.46**	**3.54**	**2.48**	**569.44**
S.E.	**2.0**	**0.11**		**2.12**		**3.77**	**1.29**	**0.16**	**59.11**

Means followed by different letters are statistically different from each other ($p \leq 0.05$) according to Duncan New Multiple Range test

Table 1.4: On-station evaluation of promising sorghum cultivars for Striga resistance and grain yield, Ilonga 2000/2001(Striga free field)

Test Entry	Stand count	50 % days to flower	Leaf blight (1-5)	Rust score (1-5)	Plant height (cm)	% Plant lodging	Grain yield (t/ha)
P9405	**44**	**60b**	**1.1a**	**1.0a**	**144ab**	**6.0a**	**2.0b**
P9406	**50**	**57a**	**1.4ab**	**1.0a**	**132a**	**3.3a**	**3.1ab**
SRN 39	54	62c	1.4ab	1.1a	177c	4.0a	3.6a
Weijita	55	63c	2.0b	1.3ab	276d	16.0b	4.3a
Macia	58	62c	1.5ab	1.0a	150b	10.3ab	3.2ab
Pato	53	63c	1.6ab	1.6b	207d	8.0ab	4.4a
Mean	**52.4**	**61.2**	**1.5**	**1.16**	**181.0**	**7.92**	**3.41**
S. E.	**1.6**	**0.5**	**-**	**-**	**10.4**	**1.32**	**0.24**

Means followed by different letters are statistically different from each other ($p \leq 0.05$) according to Duncan New Multiple Range test.

Table Evaluation of advanced sorghum materials for Striga resistance, Melela 2001

Entry	Stand count	Striga count 9WAP		Striga count 12WAP		Striga count at harvest		Rust score (1-5)	Zonate score (1-5)	% lodging	Yield (t/ha)
		S. asiatica	S. forbesii	S. asiatica	S. forbesii	S. asiatica	S. forbesii				
P9403	**48**	**0.0a**	**0.0a**	**0.0a**	**0.3a**	**0.0a**	**0.3a**	**2.0**	**2.8**	**0a**	**2.2b**
P9405	**43**	**0.0a**	**1.3a**	**10.3a**	**18.0a**	**12.3a**	**28.7a**	**1.3**	**2.2**	**0a**	**1.6ab**
P9406	**57**	**0.7a**	**2.0a**	**6.0a**	**2.0a**	**11.3a**	**5.0a**	**1.8**	**2.8**	**0a**	**2.5b**
SRN 39	**60**	**33.2b**	**39.3bcd**	**104.7b**	**117.0abc**	**89.7c**	**142.3ab**	**1.7**	**2.8**	**6ab**	**2.2b**
Pato	**52**	**15.0ab**	**29.3abc**	**44.7a**	**78.3ab**	**51.3abc**	**67.0a**	**2.0**	**2.5**	**19bcd**	**1.9ab**
Tegemeo	**52**	**11.3ab**	**58.7cd**	**33.7a**	**214.3c**	**35.7ab**	**254.3b**	**1.3**	**3.2**	**2a**	**2.4b**
Macia	**53**	**3.7a**	**65.0d**	**19.3a**	**180.0bc**	**26.0a**	**244.7b**	**1.3**	**2.8**	**2a**	**2.2b**
Weijita	**49**	**8.0a**	**8.7ab**	**36.3a**	**83.7ab**	**79.7bc**	**98.7a**	**1.3**	**2.3**	**23cd**	**2.2b**
WeijitaxPato	**37**	**4.0a**	**12.7ab**	**10.0a**	**32.7a**	**13.7a**	**49.7a**	**1.0**	**2.5**	**30d**	**2.3b**
MaciaxSAR37	**32**	**1.3a**	**0.7a**	**3.3a**	**6.7a**	**4.7a**	**11.0a**	**1.7**	**2.3**	**10bc**	**1.7ab**
SAR19xNL829	**43**	**0.0a**	**0.0a**	**0.0a**	**0.0a**	**0.0a**	**0.3a**	**2.2**	**2.3**	**0a**	**2.0b**
SV2xSAR29	**56**	**0.0a**	**0.0a**	**0.0a**	**1.3a**	**0.0a**	**2.3a**	**2.3**	**2.2**	**0a**	**2.1b**
SAR33xSV2	**45**	**0.3a**	**0.3a**	**0.7a**	**2.7a**	**1.0a**	**3.3a**	**2.0**	**2.7**	**1a**	**1.5ab**
SDS2293-6xSAR16	**46**	**0.0a**	**10.0ab**	**2.7a**	**44.3a**	**6.0a**	**61.3a**	**1.3**	**2.3**	**0a**	**0.8a**
SAR35xSV-1	**42**	**0.0a**	**0.7a**	**0.0a**	**1.0a**	**0.0a**	**2.0a**	**2.0**	**2.0**	**0a**	**1.4ab**
G. mean	**47**	**5.20**	**15.24**	**18.00**	**52.16**	**22.09**	**64.73**	**1.69**	**2.52**	**6.3**	**1.94**
S.E	**1.7**	**2.11**	**4.03**	**5.75**	**13.03**	**5.56**	**15.85**	**0.09**	**0.07**	**1.7**	**0.11**

2. On-farm evaluation of promising sorghum cultivars for Striga resistance and grain yield Dodoma rural and Missungwi Districts 2000/2001:

Introduction:

On-farm research is being carried out in Central Zone and Lake Zone to develop integrated management options for the control of *Striga asiatica* and *Striga hermonthica* in sorghum. Research activities include evaluation of sorghum germplasm for resistance/ tolerance to Striga, the use of manure and inter-cropping with legumes. Since 1996, the DFID Crop Protection Programme and the government of Tanzania have funded these activities. Following an initial three-year project, a second phase (CPP project R7564) started in 2001.

The 2000/2001 season on-farm trials were planted by participating farmers and village extension staff at 3 villages in Dodoma rural at Mvumi, Chipanga and Mpalanga villages and in Misungwi district at Mwagala and Iteja villages

Objective: To evaluation sorghum varieties for Striga resistant and grain yield on farmer's fields at 4 village in Dodoma rural and Missungwi districts:

Materials and Methods:

Sorghum cultivars P9405, P 9406, SRN 39, Pato and Macia were given to project participating farmers in Dodoma rural and Missungwi districts. Farmers in Missungwi were given extra sorghum cultivars Weijita, a landrace from Mara and Mwanangundungu from the farmers themselves. Each variety was planted at a plot size of 5m by10m and a farmer was used as a replicate. Farmers themselves did Planting and management of the trial. Data was recorded from 5m by 5m plots by extension officers. This was Striga count at 9 and 12WAP and at harvest and grain yield from the same net plot of 5m by 5m. Data obtained was then subjected to statistical analysis.

In Dodoma rural 3 villages participated in the trials namely Mvumi Makulu, Chipanga and Mpalanga (having only 5 farmers participating). In Missungwi 2 villages participated these were Mwagala and Iteja each having 10 farmers participated. The number of farmers with exception from Mpalanga was 10 farmers, the number to harvest decreased for various reasons. These included insect pest attack at milk dough stage, drought and trial not properly managed.

Results and Discussion:

Mvumi Makulu Village:

Mvumi Makulu village, 10 farmers planted 3 sorghum varieties namely Pato, P9405 and P9406. Striga numbers were lowest from sorghum cultivar P 9405 both at 12WAP and at harvest followed by P 9406. The highest Striga count was obtained from Pato at both stages of counting, but the difference was not statistically significant at $P \leq 0.05$. Highest grain yield was obtained from P 9405, but the difference compared to the control was not statistically significant. At the same village another set of 10 farmers planted sorghum entries Pato, P9405, P 9406, SRN 39 and Macia. From these 10 farmers only 8 farmers managed to get a harvestable crop the lowest Striga numbers were counted from sorghum variety P9405 and Pato had the highest. Relative highest grain yield was recorded from variety P9405 followed by P9406. The lowest grain yield was obtained from Macia.

Table2.1: On – farm evaluation of promising sorghum cultivars for Striga resistance and grain yield, Mvumi 2000/2001:

Entry	**Stand count**	***Striga asiatica* count/25m^2**		**Yield kg/ha**
		12WAP	At harvest	
P9405	55	23.4	71.8	551
P9406	53	37.6	169.5	526
SRN 39	66	95.3	238.3	514
Macia	57	105.9	119.0	309
Pato	63	55.3	532.8	509
G. Mean	59.1	63.49	226.30	482
S.E.	5.6	14.59	76.35	0.04

Table2 2: On – farm evaluation of promising sorghum cultivars for Striga resistance and grain yield, Mvumi 2000/2001

Entry	**Stand count**	***Striga asiatica* count/25m^2**		**Yield kg/ha**
		12WAP	At harvest	
P9405	78	99.4	51.4	880
P9406	78	130.0	95.0	860
Pato	78	189.5	100.9	824
G. Mean	**78**	**139.63**	**82.43**	**854**
S.E.	**5.5**	**58.02**	**29.78**	**0.07**

Mpalanga village:

At Mpalanga village five farmers planted the five sorghum varieties P9405, P9406, SRN 39 Pato and Macia and out of these farmers only four farmers managed to harvest the crop. One farmer lost the crop due to army worm attack and terminal drought. Sorghum cultivars P9405 and P9406, which had shown to support no to lowest Striga counts at other sites they were observed at Mpalanga village to support relatively high numbers of emerged Striga. The reason may be that the Striga inoculum at the village was very high Striga compared to other field sites. Striga susceptible Cultivars like Pato supported both at 12WAP and at harvest the highest Striga numbers (>600 Striga plants/25m^2). The difference on Striga counts from P9405 and P9406 compared to Pato was statistically significant at $p \leq 0.05$ (Table 3). The highest grain yield was obtained from P9405 followed by SRN 39. The cultivar Pato that had the highest Striga numbers at both stages of Striga count had the lowest grain yield (0.6t/ha). The difference in term of yields among the varieties was statistically significant (Table 3).

Table 2.3: Evaluation of sorghum promising cultivars for Striga resistance and grain yield, Mpalanga 2000/2001:

Sorghum entry	**Plant stand count**	***Striga asiatica* count/25m^2**		**Yield (t/ha)**
		12 WAP	**At harvest**	
P9405	**200**	**10.0a**	**72.8a**	**1.4c**
P9406	**190**	**286.4a**	**500.5ab**	**1.1b**
SRN 39	171	275.6a	473.6ab	1.2bc
MACIA	181	134.1a	578.4b	1.1b
PATO	184	648.2b	1533.8d	0.6a
G.Mean	**2185.6**	**270.85**	**631.83**	**1.05**
SE	**6.2**	**51.39**	**93.85**	**0.05**

Chipanga village:

A number of ten farmers planted three promising Striga resistant sorghum varieties P9405, P9406 and SRN 39 and these were compared with commercially released sorghum varieties Pato and Macia. The varieties P9405, and P9406 showed no Striga emergence at both stages of Striga count namely 12 WAP and at harvest. Sorghum variety SRN 39 started showing first Striga emergence at harvest count (Table 4a). Pato had the highest Striga numbers followed by Macia but the difference was not statistically significant. Varieties P 9405 and SRN 39 produced equal yields (1.6t/ha) followed by Pato (1.5t/ha) and the lowest yield were obtained from P9406 but the yield difference among the varieties was not statistically different. Sorghum diseases of economic importance were also observed and at this village long smut was observed to be of importance, hence it was scored by counting the number of heads showing symptoms of the disease. The data presented in Table 4 show that P9406 had the highest number of smutted heads followed by Pato and Macia and the least number of smutted heads was observed from P9405. The difference among the varieties was statistically significant.

Table 2.4: On-farm evaluation of promising sorghum cultivars for Striga resistance and grain yield Chipanga 2000/2001:

Entries	**Stand count/ 25m2**	***Striga asiatica* count/25m^2**		**# Long smut/25 m2**	**Yield t/ha**
		12 WAP	**At harvest**		
P9405	189	0.0	0.0	1.5a	1.6
P9406	191	0.0	0.0	14.4c	1.0
SRN 39	230	0.0	0.8	4.3ab	1.6
Macia	226	0.0	16.0	10.9bc	1.4
Pato	185	46.3	99.7	11.8bc	1.5
Mean	**204.3**	**9.27**	**23.28**	**8.57**	**1.42**
S.E.	**8.4**	**7.99**	**15.30**	**1.41**	**0.11**

From farmers who planted 3 sorghum varieties P9405, P9406 and Pato, the sorghum varieties P9405 and P9406 supported the least Striga numbers and when these two varieties were compared to the susceptible check Pato, the difference was statistically significant at $p \leq 0.5$ (Table 4b)
The highest grain yield was obtained from variety P9405 followed by P9406. Compared to Pato the yield difference of the two varieties was relatively higher but it was not statistically significant (Table 4b)

Table 2.5: On-farm evaluation of promising sorghum lines for Striga resistance and grain yield, Chipanga 2000/2001:

Entry	Stand count/ 25 m2	*Striga asiatica* count/25m^2		Yield t/ha
		12 WAP	**At harvest**	
P9405	115	1.6a	4.4a	1.0
P9406	117	2.3a	4.6a	0.9
Pato	127	55.8b	109.8b	0.7
Mean	**120.4**	**19.89**	**39.61**	**0.87**
S.E.	**5.5**	**7.5**	**12.31**	**0.07**

Iteja village:

For the farmers who planted six sorghum varieties namely P9405, P9406, SRN 39, Weijita, Macia and Pato, there was statistical difference in counts of emerged Striga plants at both at12WAP and at harvest. Low Striga numbers were observed from P9405 and P9406 and the difference between these two varieties in terms of Striga accounts and yields was not statistically significant (Table 5a). The second group was sorghum variety SRN 39, Macia and Weijita; these had Striga numbers higher than those of P9405 and P9406 respectively. Among the varieties Striga count differences were not statistically significant. The highest Striga count was observed from commercial sorghum variety Pato (Table 5a). In terms of grain yield Pato had slightly higher yield than the rest of the varieties and this may be contributed by early planting as most of these farmers planted the crop during the short rains. Striga started infesting the crop after it had advanced. Pato has high yield potential compared to the rest of the varieties under favorable conditions. The lowest grain yield was obtained from sorghum landrace Weijita. From farmers who planted sorghum varieties P9405, P9406, Pato and Mwanangundungu - a landrace sorghum variety, sorghum variety P9405 had the lowest number of emerged Striga at both stage counts followed by P9406. The highest Striga count was observed from local landrace Mwanangundungu (Table 2.7). Sorghum grain yields were not of much difference among the varieties and this may be due to similar reasons given above.

Table 2.6: On-farm evaluation of promising sorghum varieties for Striga resistance and grain yield, Iteja 2000/2001:

Entry Name	**Stand count/25m2**	***S. hermonthica* count /25m^2**		**Yield t/ha**
		12 WAP	At harvest	
P 9405	64	9.3a	10.4a	1.0
P 9406	73	6.7a	7.8a	1.0
SRN 39	73	42.4ab	45.6ab	1.1
MACIA	85	28.7ab	31.6ab	1.1
WEIJITA	68	48.0ab	55.1ab	0.6
PATO	85	58.7b	66.3b	1.2
G. Mean	**74.6**	**32.32**	**36.14**	**1.01**
S.E.	**4.9**	**6.42**	**7.01**	**0.07**

Table 2.7: On-farm evaluation of promising sorghum varieties for Striga resistance and grain yield, Iteja 2000/2001:

Entry	Stand count/25m2	*Striga hermonthica* count/25m^2		Yield t/ha
		12WAP	At harvest	
P9405	74	1.2	1.5	1.9
P9406	74	9.4	13.5	1.8
Pato	85	21.6	23.9	1.9
Mwanangundungu	76	183.4	193.4	1.9
G. Mean	**77.1**	**53.83**	**58.08**	**1.67**
S.E.	**8.5**	**35.30**	**36.47**	**0.22**

Mwagala village:

At Mwagalla village farmers faced a lot of problems from crop germination to the stage of grain filling. During germination there was a problem of cricket, which attacked the seedlings. The crop, which managed to reach maturity, there was a problem of green hoppers and midge, which attacked sorghum grain at milk dough stage and for those farmers who planted as late as April the crop experienced terminal drought. Relative low Striga numbers were observed from varieties P9406, Macia and P9405 at both stages of Striga count. The grain yields were generally low for all the varieties tested but the local variety Mwanangundungu had relatively highest grain yield and SRN 39 had the lowest (Table 2.8).

Table 2.8: On-farm evaluation of promising sorghum varieties for Striga resistance and grain yield, Mwagalla 2000/2001:

Entry	Stand count/ 25 m^2	*Striga hermonthica* count/25m^2		Yield t/ha
		12WAP	At harvest	
P9405	38	11.5	18.2	252
P9406	38	11.2	13.8	372
SRN 39	27	21.8	40.9	228
Weijita	27	29.0	47.1	452
Macia	25	9.6	7.5	239
Pato	39	29.1	40.8	350
Mwa'ndungu	10	14.2	20.0	600
Mean	**31.9**	**18.3**	**27.29**	**321.0**
S.E.	**2.1**	**3.5**	**4.59**	**0.04**

3. The Use of animal manure as a component of integrated Striga control in sorghum:

Objective: **To use animal manure with target to the crop for control of Striga and increase yield of sorghum.**

Introduction:

Fertility has been an important factor for increase of Striga problem and also reduction of cereal grain yield. Plots were soils are relatively fertile, the problem of Striga has been much reduced and substantial crop yield has been realized. Farmers cannot afford to purchase inorganic fertilizer and for an alternative the use of animal manure has been suggested. In most cases farmers have been broadcasting manure across the field which lead to increase of weeds and at the same time the fertilizer get washed with rain also it become not directly used by the targeted crop**.**

Materials and Methods:

The treatments included plots with no, ¼ kg and ½ kg animal manure application per hill. The plot size was 5m by 5m and farmer was used as a replicate. The trial was superimposed on the promising Striga resistant sorghum cultivars. This trial was planted at Mpalanga, Chipanaga in Dodoma rural and Mwagala and Iteja in Missungwi district. Farmers at Mvumi Makulu village in Dodoma rural district failed to get animal manure because they are in HADO system. Data recorded included Striga count 12WAP and at harvest and sorghum grain yield. Data obtained was subjected to statistical analysis

Results and Discussions:

Mpalaga village:

The Striga numbers at both stages of Striga counts 12 WAP and at harvest decreased with increase of amount of animal manure applied per hill (from 0 to ½ kg per hill) and the lowest Striga count was from a treatment of ½ kg animal manure per hill. Compared to the control application of ½ kg animal manure at both stages of Striga count (12WAP and at harvest) Striga numbers decreased by 75.5 and 73.7% respectively but the difference was not statistically different at $p \leq 0.05$. The grain yield increased from 1.3 to 1.5 t/ha and it was highest, where ½ kg animal manure was applied (Table.3.1)

Table 3.1: Effect of animal Manure on control of Striga and sorghum

Grain yield Mpalanga village 2000/2001

Animal manure level	Plant stand	STRIGA COUNTS		Yield (t/ha)
		Striga 12WAP	At harvest	
O kg manure/hill	201	15.5	117.8	1.3
1/4kg manure/hill	201	10.8	69.8	1.3
1/2kg manure/hill	198	3.8	31.0	1.5
Mean	200.3	10.00	72.83	1.35
S.E.	10.7	3.53	23.44	0.08

Chipanga village:

The Striga numbers decreased with increase of animal manure rates and the lowest Striga count was observed from treatment of ½ kg animal manure per hill. At both stages of Striga counts, the ½ kg animal manure per hill had zero Striga counts and sorghum grain yield increased from 0.8t/ha from where there was no manure applied to 1.2 t/ha from ½ kg manure per hill. This was a grain yield increase of 50% compared to the treatment without manure (Table.3.2) but the increase was not statistically different.

Table.3.2: Effect of animal Manure on control of Striga and sorghum grain yield Chipanga village 2000/2001

Animal manure/hill	Stand count/ 25 m2	S. asiatica count/25m^2		Yield t/ha
		12 WAP	At harvest	
0	115	1.5	4.5	0.8
¼	112	3.3	8.8	0.9
½	117	0.0	0.0	1.2
G. Mean	**114.6**	**1.58**	**4.42**	**0.98**
S.E.	**8.9**	**1.15**	**3.16**	**0.15**

Iteja village:

Generally there was lower Striga numbers from plots were manure had been added compared to without using animal manure. Striga numbers were observed lowest from ¼ kg animal manure treatment. This may due to low plant population as shown in Table and similar trend was also observed on grain yield. The highest grain was obtained from ½ kg per hill treatment and it was statistically significant when it was compared to the control. Four farmers who a applied only two treatments without and with ½ kg animal manure per hill, less Striga numbers were observed from ½ kg animal manure and emerged Striga plants were reduced by more than 50% compared to the control (Table 3.3b). Sorghum grain yield increased only by12.5%.

Table 3.3a Effect of animal Manure on control of Striga and sorghum grain yield Iteja 2000/2001

Animal manure/hill	Stand count/25 m^2	*S. hermonthica* count/25m^2		Yield t/ha
		12 WAP	At harvest	
0 kg	92	44.7	50.4	0.9a
¼ kg	54	18.7	21.3	0.8a
½ kg	77	33.6	36.7	1.3b
G. Mean	**74.7**	**32.32**	**36.14**	**1.01**
S.E.	**4.9**	**6.42**	**7.01**	**0.07**

Table 3.3b.ITEJA

Animal manure/hill	Stand count/ 25m^2	Striga count/25m^2		Yield t/ha
		12 WAP	At harvest	
0 kg	117	123.9	130.0	2.4
½ kg	115	37.6	44.3	2.7
G. Mean	**77.1**	**53.83**	**58.08**	**1.67**
S.E.	**8.5**	**35.30**	**36.47**	**0.22**

Mwagala village

Striga numbers decreased significantly with the increase of animal manure from zero to ½ kg manure per hill especially at 12WAP. The lowest Striga numbers were recorded from the treatment of ½ kg manure per hill. At harvest the trend was the same but compared to the control the difference was not statistically significant.

In conclusion application of animal manure reduce the number of emerged Striga and it is more pronounced from ½ kg animal manure per hill treatment.

Table 3.4: Effect of animal Manure on control of Striga and sorghum grain yield Mwagala 2001

Amount of manure/hill	Stand count	Striga count/25m^2		Yield kg/ha
		12 WAP	At harvest	
0kg/ha	34	29.0a	38.1	227
¼ kg/ha	32	14.8ab	25.4	268
½ kg/ha	30	9.5b	16.5	493
G. Mean	**31.9**	**18.29**	**27.29**	**321.0**
S.E.	**2.1**	**3.45**	**4.59**	**0.04**

4.: Intercropping of sorghum with legume to control Striga on farmer's fields; 2001season:

Introduction:

Intercroping has been a traditional form of farming system of majority of small-scale farmers. This helps them to serve labour and at least to have two types of crops from the same fields and also has been used as risk avoidance.

Materials and methods:
The trial was planted at four villages namely Mvumi in Dodoma rural, Iteja and Mwagala in Misungwi districts. Treatments included sorghum pure stand and sorghum intercropped with groundnuts (Mvumi) and cowpea variety Tumaini in the same row. Sorghum varieties used were Pato and P9405 susceptible and resistant to Striga infestation respectively. Plot size was 5m by 5m and farmer was a replicate. Data collected included Striga count at 12WAP and at harvest and sorghum grain yield. The data was subjected to statistical analysis.

Results and discussions:
Mvumi Makulu:
Farmers in Mvumi used groundnut variety nyota for intercropping with cereals. There was less Striga numbers observed on intercrop of Pato with Nyota when compared with Pato in pure stand. There was no difference on Striga numbers from P9405 in intercrop and P9405 in pure stand. Highest sorghum yield was obtained from Pato in pure stand followed by Pato in intercrop. Intercrop of P9405 gave a yield of 1.1t/ha for both treatments (Table 4.1)

Table 4.1.Effect of intercropping on the control of Striga; Mvumi Makulu 2000/2001

Treatment	Striga asiatica count/25m^2		Yield t/ha
	12WAP	At harvest	
P9405	61.0	78.3	1.1
P9405 + intercrop	52.0	104.3	1.1
Pato	346.3	370.0	3.0
Pato + intercrop	172.7	167.3	1.3
Mean	**158.00**	**180.00**	**1.52**
S.E	**51.43**	**47.50**	**0.14**

Mwagala:

The lowest Striga count was observed from Pato intercrop followed by P9405 inter-cropped with Cowpea variety Tumaini. The highest Striga numbers were observed from Pato in pure stand. Generally the grain yields were low due to insect damage at grain filling stage and terminal draught, which occurred at that growth stage. Relative high yields were obtained from pure P9405 and Pato.

Table 4.2. Effect of intercropping on the control of Striga Mwagala 2000/2001

Treatment	Striga count/25m^2		Yield kg/ha
	12WAP	At harvest	
P9405	3.6	18.6	.200
P9405 + intercrop	0.0	1.6	100
Pato	6.8	57.4	200
Pato + intercrop	0.2	1.2	100
Mean	**2.65**	**19,7**	**170.0**
S.E	**0.98**	**8.81**	**40.0**

Iteja Village:

Striga numbers were observed from Pato and Pato intercrop with cowpea variety Tumaini.

Both P9405 and P9405 intercropped with Tumaini had zero Striga counts. Highest sorghum yield was realized from Pato pure stand followed by P9405 in pure stand and the lowest sorghum yield was obtained from P9405 intercropped with cowpea. Similar problem of insect damage of grain at sorghum grain filling was observed in this village, which lead to low grain yields of sorghum. Yields from cowpea were not recorded because farmers ate them as green.

Table 4.3. Effect of intercropping on the control of Striga, Iteja 2000/2001

Treatment	Striga count/25m^2		Yield kg/ha
	12WAP	At harvest	
P9405	0.0	0.0	500
P9405 + intercrop	0.0	0.0	380
Pato	0.5	1.0	720
Pato + intercrop	0.5	0.5	420
Mean	0.25	0.38	505.0
S.E	0.16	0.26	108.0

5 Evaluation of introduced maize cultivars for adaptation and Striga resistance/tolerance at Striga hot spots in the Eastern Zone of Tanzania

Introduction

Maize ranked first of the major cereal grains grown in Tanzania and is a very important staple food for the entire population. The crop is mainly produced by smallholder farmers on 1 – 3 hectare holdings accounting for about 85% of the total crop production (Moshi *et al*.1987). Despite of the importance of the crop, maize yields under farmer's fields are only 1.2 tons per hectare compared to the estimated potential yields of 4- 5 tons per hectare (Kaswende *et al*., 1998). It was identified that the relatively poor yields of maize are due to range of factors; the major ones include declining of soil fertility, lack of high yielding maize cultivars, diseases and Striga problem.

Striga is a root hemi parasite infecting a wide range of tropical cereals including maize, sorghum, millets, upland rice and sugarcane. Striga infestation usually results in substantial yield losses, quite often over 70%, (Kim, 1991).

In Eastern zone of Tanzania, the predominant Striga species are *Striga asiatica* and *S. forbesii*, both of which parasites maize. Striga management in farmers' fields in the zone has concentrated mainly on cereal legume rotations, intercropping and Nitrogen fertilization, (Mbwaga, 1996).

Resistant or tolerant genotypes are a major practical and reliable approach to the management of Striga particularly in the context of smallholder farmers. It is a strategy that requires a limited financial outlay and more likely to be accepted by farmers (Debra 1994).

From farmers' point of view, incorporation of host plant resistance in maize is a potential important means of Striga control as it may be cheap and effective. This study was therefore initiated to evaluate the Striga promising maize materials at the station.

Objectives

- To evaluate the performance of promising Striga tolerant /resistant maize varieties on station.
- To increase maize productivity per unit area in Striga prone areas

Materials and methods

The trial consisted of 8 early and 12 late/intermediate maturing open pollinated maize lines from IITA bred for *Striga hermonthica* resistance. Local checks included TMV-1 and Staha for early and late/intermediate maturing respectively. These materials were evaluated for Striga resistance at two locations, Mwele seed farm in Muheza district a location with natural high *Striga asiatica* infestation and at Melela, a hot spot for *S. asiatica* and *S. forbesii. The* materials were evaluated both during short and long rain seasons at Mwele while at Melela the materials were evaluated during the long season due to a location having a monomodal rainfall.

At Mwele, the area was fumigated with Methyl bromide two seasons a go to create a Striga free plot and then divided in two blocks. One block was artificially inoculated with Striga at a rate of about 2000 viable Striga seed per hill at maize sowing and the other half was not inoculated. The trial was laid out in a Randomized Complete Block Design with three replications. Each plot comprised of four rows, of 5-metre long. Maize was planted at a spacing of 60cm between hills and 75cm between rows and 2plants per hill. Low doses of 25kg N/ha in the form of CAN and of 40kg P_20_5 per hectare were applied to the blocks in a single application.

Data recorded from the trials included plant stand at thinning and at harvesting, plant height at crop maturity, Striga counts at 9 and 12 weeks after planting (WAP) and grain yield. Disease incidence was also recorded. At second weeding, the plots were hand weeded leaving Striga plants unweeded.

The data obtained was subjected to statistical analysis.

Plant Materials

Early open pollinated maize lines

- Acr. 94TZE Comp.5-W
- Acr. 94TZE Comp.5-Y
- TZE Comp.5C_6
- 98 Syn WEC
- EV.DT 97STR C_1
- Acr.94 Pool 16 DT STR
- TZE Comp.3C_3 (susceptible)
- TZE Comp.4C_4 (susceptible)
- TMV-1 (check)

Late/intermediate open pollinated maize cultivars

TZ 96 STR Syn-W
TZ 96 STR Syn-Y
Acr.93 TZL Comp.1-W
TZL Comp.1-W
IWD STR CO
IWF STR CO
STR EV. IWD
STR EV. IWF
Z diplo BC_4C_2
TZB SR (susceptible)
8338-1 (susceptible Hybrid)
9022 (Resistant hybrid)

Staha (check)

Results and Discussions

Total rainfall received at Mwele seed farm, is shown in Appendix 1. It was relatively high but it was not evenly distributed for the maize crop in the season. During the 2000 short season, results for early and late/intermediate open pollinated maize lines are presented in Tables 5.1 and 5.2. Compared to past seasons Striga counts were relatively high at both counting dates, especially from Early open pollinated maize lines (Table.5.1) and there was no statistical Striga count difference among the entries. Entry 98 Syn WEC recorded relative the lowest Striga infestation. Entry EV.DT 97 STR C1 produced the highest grain yield (2.4t/ha) under Striga infestation and the difference was statistically significant among the other entries. The lowest yield was observed from entry 98 Syn. WEC 1.0t/ha. Under no Striga infestation highest maize yield was obtained from entry TZE Comp. $5C_6$ followed by entry Acr. 94 Pool 16 DT (sus). In terms of yield loss TMV-1 had the least (13.3%), while the highest loss was observed from entry 98 Syn WEC followed by entries TZE Comp 5 C_6 and Acr. 94 TZE Comp 5-y and the difference was statistically significant.
From Late/intermediate maize lines planted during the short rains at Mwele, Striga infestation was relatively low at both 9^{th} and 12^{th} counting dates (Table 5.2). At the two counting dates, the lowest Striga numbers were observed from entries Z. diplo. BC_4C_2, STR EV.IWD, TZ 96 STR Syn-W and TZB SR (susc) but the difference among the entries was not statistically significant (Table 6.2). Grain yield under Striga infestation was recorded highest from entry STR EV. IWF (3.0t/ha). Followed by Z. diplo. B4C2, STR EV.IWD and 9022-13 (susc.). TZ 96 STR Syn-W produced the lowest yield. Under Striga free plot entry STR EV. WF produced the highest grain yield (4.1t/ha) and the yield difference among the varieties was statistically significant.
The highest yield loss was observed from entry TZ 96 STR Syn.- W (56.1%) while the check Staha had a yield loss of 28.8%. From previous findings Staha is known to be tolerant to Striga infestation.
Late/intermediate maize cultivars tested at Mwele during the main growing season Striga infestation was relative low compared to the short rains, however the zero count at both dates of Striga count 9^{th} and 12^{th} week after planting was observed from maize entry STR EV.IWD and Z. diplo BC_4C_2 followed by TZL Comp 1-C_4, TZ 96 STR Syn-Y and TZ 96 STR Syn-W (<2 Striga/7.5m^2) (Table 5.3)
The highest grain yield at Mwele was observed from 9022-13 (Res.Hyb) (3.3t/ha) and it was statistically significant different from other entries at $P<0.05$. The lowest yield was recorded from TZ 96 STR Syn-W.

At Melela location planted with late/intermediate open pollinated maize varieties, there was a significant high count of S. forbesii from maize entries Acr. 93 TZL Comp. 1-W, TZB-SR (sus. Hyb.), and Staha at both counting dates. Entries TZ 96 STR Syn-W, TZ 96 STR Syn-Y, 9022-13 (Resis. Hyb) and Z. diplo BC_4C_2 had less than 2 Striga plants per 7.5m^2 (Table 5.4).
The highest grain yield was observed from maize entry STR EV. IWF followed by Z. diplo BC_4C_2 and TZL COMP. $1C_4$ and the yield difference was statistically significant at $p<0.05$.
During the season there was also high incidence of leaf blight at Melela site, using a score scale of 1-5, where 1= no disease and 5= severe disease

symptoms, highest disease score was obtained from maize entry TZ 96 STR Syn-W followed by TZB-SR (susc. Hyb) hence these are regarded to be susceptible to the disease. Lowest score was obtained from entry IWF STR CO and IWD STR CO. The disease score difference was statistically significant among entries tested.

Table 5.1: Evaluation of Early open pollinated maize lines for Striga resistance and grain yield, Mwele seed farm 2000/01 short season

Entry Name	Striga count/7.5m^2		Yield (t/ha) Not Striga inoculated	Yield (t/ha) Striga inoculated	Yield loss (%)
	9 WAP	12 WAP			
Acr, 94 TZE Comp 5-W	349.3	380.7	2.5a	1.2ab	52.2bc
TMV – 1 (check)	338.7	338.0	2.5a	2.1ab	13.3a
TZE Comp 4C2 (susc.)	297.7	319.7	2.7ab	2.0ab	25.2ab
TZE Comp 3C2	338.7	340.3	3.1abc	1.8ab	40.0abc
Acr. 94 TZE Comp 5-Y	395.0	417.3	3.2abc	2.0ab	40.2abc
98 Syn WEC	89.7	103.0	3.3abc	1.0a	68.3c
EV. DT 94 STR C_1	338.7	144.3	3.3abc	2.4b	29.9ab
Acr. 94 Pool 16 DT (susc.)	204.0	297.3	3.5bc	1.6ab	55.3bc
TZE Comp 5C6	254.0	263.7	3.9c	1.7ab	56.9bc
Mean	**267.9**	**293.2**	**3.11**	**1.76**	**42.4**
SE ±	**43.4**	**44.8**	**0.12**	**0.13**	**4.31**

WAP = Week after planting, Means followed by different letters are statistically different from each other ($p \leq 0.05$) according to Duncan New Multiple Range test.

Table 5.2: Evaluation of late/intermediate open pollinated maize lines for Striga tolerance/resistance and grain yield under Striga infestation, Mwele seed farm 2000/01 short season

Entry	Striga count/7.5m^2		Yield (t/ha) Not Striga Inoculated	Yield (t/ha) Striga Inoculated	Yield loss (%)
	9 WAP	12WAP			
833-1 (susc. Hyb)	47.0	63.7	2.2a	1.8	18.8
Staha (check)	130.0	133.0	2.5ab	1.8	28.8
TZ 96 STR Syn –Y	10.7	22.7	2.5ab	1.8	28.9
TZL Comp. 1-C4	30.3	35.3	2.5ab	2.3	3.0
TZB SR (susc)	9.0	12.0	2.8ab	2.2	23.3
9022 – 13 (susc.)	77.0	97.0	3.2ab	2.8	2.4
STR EV.IWD	6.7	12.0	3.3ab	2.8	9.7
TZ 96 STR Syn – W	5.0	14.0	3.4ab	1.5	56.1
Z. diplo BC4C2	0.0	7.3	3.4ab	2.8	14.9
IWF STR CO	41.0	43.3	3.7ab	2.6	19.6
Acr. 93 TZL Comp 1-W	287.7	295.1	3.7ab	2.0	39.6
IWD STR CO	24.7	32.7	3.9ab	2.5	35.0
STR EV. IWF	190.7	139.0	4.1b	3.0	24.0
Mean	**66.2**	**77.5**	**3.18**	**2.3**	**23.4**
SE ±	**25.5**	**27.5**	**0.15**	**0.13**	**4.94**

WAP = Week after planting

Table 5.3: Evaluation of late/intermediate open pollinated maize lines for Striga resistance and grain yield, Mwele seed farm 2001, and long season

Entry	Striga count / 7.5m^2		Yield (t/ha)
	9 WAP	12 WAP	
TZ 96 STR Syn-W	0.0	1.3	1.7
TZ 96 STR Syn-Y	0.0	0.3	2.5
Acr 93 TZL Comp 1-W	13.3	27.0	2.1
TZL Comp 1-C4	0.0	1.3	2.6
IWD STR CO	63.0	100.7	1.9
IWF STR CO	4.0	14.0	2.2
STR EV.IWD	0.0	0.0	2.4
STR EV. IWF	66.0	90.3	2.5
Z. diplo BC4C2	0.0	0.0	2.9
TZB SR(susc)	2.3	2.7	2.5
8338-1 (susc Hyb)	8.7	20.7	2.8
9022-13 (Resist hyb)	28.7	23.0	3.3
Staha (check)	37.7	19.7	2.4
Mean	**17.4**	**23.2**	**2.4**
SE ±	**7.6**	**10.5**	**0.1**

WAP = Week after planting

Table 5.4: Evaluation of Late/intermediate open pollinated maize lines for Striga Resistance and Grain yield; Melela 2001

Entry Name	Striga count 9WAP/7.5m^2		Striga count 12WAP/7.5m^2		Leaf blight score (1- 5)	Yield (t/ha)
	S. asiatica	S. forbesii	S. asiatica	S. forbesii		
TZ 96 STR Syn-W	0.0	0.0	0.0	0.0	4.0	1.4
TZ 96 STR Syn-Y	0.3	1.3	0.3	1.0	3.2	1.1
Acr.93 TZL Comp 1-W	14.0	5.7	25.0	3.3	3.0	1.6
TZL COMP. 1C4	0.7	3.0	2.0	4.3	3.2	2.2
IWF STR CO	0.0	1.3	0.0	3.7	2.2	2.1
IWD STR CO	0.3	1.3	1.7	5.3	2.2	0.8
STR EV. IWD	0.3	1.3	0.3	4.0	3.0	1.6
STR EV. IWF	0.0	0.7	0.7	2.3	2.5	2.5
Z. diplo BC4C2	0.0	0.7	0.3	0.3	2.8	2.2
TZB-SR(susc. Hyb)	13.0	7.7	14.3	14.0	3.7	0.9
8338-1(susc.Hyb)	0.3	1.3	1.3	3.3	3.2	1.7
9022-13 (Resis. Hyb)	0.0	0.0	0.0	1.0	2.8	1.2
STAHA	4.3	14.0	16.7	23.8	2.8	2.0
Mean	**2.59**	**2.92**	**4.82**	**5.33**	**2.96**	**1.64**
SE	**1.47**	**0.95**	**2.47**	**1.62**	**0.11**	**0.13**

WAP = Week after planting. Scale (1 – 5): 1 = very good, 5 = worse

6. On-farm evaluation of fertilizer (Urea) use on the Control of Striga Kyela 2000/2001:

Striga asiatica has been observed a major constraint to upland rice production in the project area. For the past three years the trial on the use of urea was conducted on-farmers fields. The other problem in the project area is the parasitic weed Ramphicarpa fustilosa, a parasitic weed on flooded rice. The effect on the crop yield by the weed has been extremely high.

Materials and Methods:

The trial was conducted in 2 villages. Three rates of urea were used 0, 25 kg and 50 kg/ha was applied. A rice variety Supa India was used as a test Striga susceptible crop; a farmer was used. From the two villages namely Kilasilo and Itope/Busale ten farmers fro tiered to conduct the trial. The plot size was 5m by 15m and data was collected from 5 x 5m. Data recorded included plant count after thinning, Striga count at 9 and 12 weeks after planting (WAP) and at harvest. The yield data was recorded from the same plot.

Data was then subjected to statistical analysis.

Results and Discussion:

The trial was conducted for the fourth year. Although Striga infestations levels were low Compared to other years (this season was no Striga season), but the trend was the same as for the past three seasons. The Striga count was highest from the control at all stages of Striga count and this was the same at both villages Kilasilo and Itope/Busale. There was a general decrease of Striga numbers with increase of fertilizer levels at all stages of Striga counting. Lowest Striga numbers were observed at 50kg N/ha treatment at both villages (Tables 61 and 6.2). The Striga numbers were not statistically significant different among the treatments.

Yield increased from zero treatment to 5okg N/ha and the increase was statistically significant. For Itope yield increased from zero treatment to 50 kg N/ha by 52.3%, while from Kilasilo was by 39.1%? Compared to 2000 season highest yield increase was obtained from Kilasilo. This season can be regarded as a no Striga year for Kilasilo and towards flowering dry weather, which affected the performance of the rice crop. From these results we learn that application of 50kg N/ha reduce Striga to economical level and increase yield significantly. During evaluation of the trials with farmers, farmers were convinced that urea reduces Striga infestation but it does not eradicate it and yield of rice increased significantly.

There was one farmer, who compared the two urea rates and green mature by incorporating Crotalaria. The results of green manure were similar to 50kg N/ha. From these results and on economical scale farmers were stimulated and unanimously decided to try the use crotalaria starting next cropping season because it requires less cash. Seed of crotalaria has been multiplied at Ilonga and it is to be distributed to farmers in the project area next season.

Conclusion:

Urea at a rate of 50kg N/ha reduces Striga infestation more than 50% and the expected rice yield increase almost by 50%.

Table 6.1: Evaluation of fertilizer (urea) levels on the control of Striga, Itope/Busale 2000/2001

Fertilizer level kg N/ha	Stand count/25m^2	Striga asiatica count/25m^2			Yield t/ha
		9WAP	12 WAP	At harvest	
0	363	13.4	29.0	29.9	2.1
25	364	9.9	13.4	24.0	3.4
50	370	10.3	12.7	13.2	4.4
Mean	**365.7**	**11.20**	**18.37**	**22.37**	**3.26**
SE	**7.4**	**4.88**	**8.63**	**10.13**	**0.24**

Table 6.2: Evaluation of fertilizer (urea) levels on the control of Striga, Kilasilo 2000/2001

Fertilizer (Urea) N kg/ha	Stand count/25m^2	Striga asiatica count/25m^2			Yield t/ha
		9WAP	12 WAP	At harvest	
0	351	3.6	6.0	7.0	2.8
25	347	2.3	5.1	5.4	3.6
50	351	0.6	2.1	2.3	4.6
Mean	**349.5**	**2.15**	**4.41**	**4.93**	**3.67**
SE	**7.0**	**0.66**	**1.06**	**1.10**	**0.33**

Literature cited

Debra, S.K. 1994: Socio-economic constraints to the adoption of weed control technics: The case of Striga control in West Africa Semi-arid Tropics. International J. Pest Management 40: 153-158.

Kim, S. K. 1991: Breeeding maize for Striga tolerance and development of field infestation technic. Pg 96-108. In Kim, S.K (ed): Combating Striga in Africa. Proceedings, International Workshop, organized by IITA, ICRISAT and IDRC Aug. 22-24, 1988,Ibadan, Nigeria.

Mbwaga A. M., 1996: Status of Striga species in Tanzania: Occurrence, Distribution and on farm control packages. Pages 195-200 In Draught-tolerant crops for southern Africa: Proc. of the SADC?ICRISAT Regional Southern and Pearl millet Workshop, 25-29 July 1994. Gaborone, Botswana (Leuschner, K. and Manthe, CS. Eds). Pantancheru 502 324, Andhra Pradesh, India.

Mbwaga, A. M., Kaswende, J and Shayo, E. 2000: A reference manual on Striga distribution and control in Tanzania. Ilonga Agricultural Research Institute, Tanzania. 26p

Mbwaga, A. M., Kaswende, J. and Mduruma, Z.: Integrated Striga control options in maize for small scale farmers in Tanzania. Final technical report Project No. ARF/CR/94/032. Division of Research and Development 2001.32p

Moshi, A., Anandajayasekeram, P., Kaliba, A., Martella, D., Mwangi, W. and Shao, F. 1997: Economic impact of maize Research in Tanzania. MOA , Division of Research and Development.

Reichmann, S., Kroschel, J. and Sauerborn, J. 1994: Distribution and infestation of Striga in Shinyanga region of Tanzania and evaluation of control measures. Brighton Crop Protection