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Interference of *Commelina benghalensis* with the performance of *Solanum macrocarpon* and *S. aethiopicum*.

Sola Ogunyemi and O. I. Ojo
Department of Crop Protection and Environmental Biology, University of Ibadan, Ibadan, Nigeria.

ABSTRACT

Solanum macrocarpon and *S. aethiopicum* are popular indigenous vegetable crops in Southern Nigeria. In a pot culture study with completely randomized design (CRD), plants of *Solanum macrocarpon* and *S. aethiopicum* were allowed to interact with *Commelina benghalensis*, a common tropical weed of arable lands, for five durations of interference. Results showed that the two *Solanum* species were sensitive to interference from the weed species. Marketable yield losses of 60.6% and 68.2% were recorded for *S. macrocarpon* and *S. aethiopicum* respectively. The results suggest that the two vegetable crops should be kept free of *C. benghalensis* as from two weeks after planting. There is also the indication that *S. macrocarpon* and *S. aethiopicum* may not attain their optimum yields in mixed cropping systems.

INTRODUCTION

The family Solanaceae comprises about seventy-five genera and two thousand species, out of which about eight genera occur in Nigeria. Solanum is the type genus and 21 species of the genus are found in Nigeria. Out of these, S. nigrum, *S. aethiopicum*, *S. macrocarpon*, S. melongena and S. tuberosum are cultivated in different parts of the country. The species *S. macrocarpon* (osun) and *S. aethiopicum* (igbo, igbagba) are cherished potherbs in Southern and middle belt parts of Nigeria. Though the cultivation of these vegetable crops is as old as farming itself, not much research work has been done on their biology and it was only in the last two decades that some attention has been paid to their agronomy (Norman 1972, Oyenuga and Fetuga 1975, Gbile and Sowumi 1976, Gruben 1977, Akanbi 1978, Omodiji 1979, Gbile 1980, 1981). There are no reported studies on the influence of weed species on the performance of these traditional crops.

Commelina benghalensis is a common noxious weed of arable land in Southern Nigeria and its noxiousness stems from its ability to tolerate various herbicides and to produce seeds from underground stems/rhizomes. It has been amply reported that *C. benghalensis* is not susceptible to chemical control as some chemicals merely scotch the leaves, leaving the underground parts unaffected. Various efforts have been made to control this species in sugarcane, rice and cotton (Ivens 1967, Estenes 1972, Ray 1973, Edward 1974, Ghosh 1978, Welala 1978, Moody 1983).

For a certified troublesome weed of arable land, it is important to quantify crop losses attributable to interference from this weed when allowed to grow in association with cultivated crops. This report highlights the influence of *C. benghalensis* on the growth and yield of *S. macrocarpon* and *S. aethiopicum*.

MATERIALS AND METHODS

Viable seeds of *S. macrocarpon* and *S. aethiopicum* were planted in seed trays filled with sterilized topsoil and watered regularly. The resulting seedlings were nursed for four weeks before they were transplanted. Plastic pots (20cm diameter at the rim and 18cm deep) were filled with about 4.5 kg of sterilized topsoil. Seedlings were transplanted into the pots at the rate of one seedling per pot. Two stem cuttings of *C. benghalensis* were planted three centimeters (3cm) on either side of the crop seedling in the pot. Each stem cutting had at least two nodes from which lateral branches could emerge. The pots were laid out in completely randomized design (CRD) with four replicates. The plants were given two weeks to establish before observations and measurements were commenced. A pilot test on the rate of establishment of *C. benghalensis* stem cuttings had shown that they require 6-8 days to establish. The weeds were then removed at two weekly intervals to effect the following competition duration for each crop species:

D0 -- Completely weed free throughout the duration of the experiment.

D1 – Competition for two (2) weeks then kept completely weed free.

D2 – Competition for four (4) weeks then kept completely weed free.

D3 – Competition for six (6) weeks then kept completely weed free.

D4 – Completely weedy throughout the duration of the experiment.

At eight (8) weeks after planting, seedlings were sprayed with Cymbush (Cyper-methrin) at 0.3ml/litre to combat aphids and other insect pests. Subsequent spraying was done at 2-weekly intervals with Sumithion (Fenitrothion) at the rate of 0.8ml/litre throughout the experimental period.

Harvesting was done at 14 weeks after planting. The plants were uprooted and the following parameters were measured and recorded;

a.) number of leaves b.) stem height
c.) stem fresh weight d.) leaf fresh weight
e.) root fresh weight.

Dry weight of relevant parts were obtained by oven drying for 48hours at 70°C before weighing. The results were subjected to a one-way analysis of variance (ANOVA) and significant differences were sought at the 5% probability level.

RESULTS AND DISCUSSION

The two crops responded in similar manner to interference from *C. benghalensis* (Tables 1-3). For the two species, number of leaves and leaf area were significantly ($P<0.05$) affected by competition from this weed. The longer the period of interference, the smaller the leaf area and the fewer the number of leaves in the two vegetable species. Leaf area and number of leaves are important agronomical characters because they dictate the marketability of potherbs. Percentage reductions in leaf size in *S. macrocarpon* and *S. aethiopicum* between the completely weed free stand (D0) and completely weed infested stand (D4) were 64.0 and 57.9 respectively. Such losses in marketable yield may be devastating to these crops.

Stem height was highest in the weed free stands. There were 48.0% and 57.0% reductions respectively for *S. macrocarpon* and *S. aethiopicum* between the weed free stands and the completely weedy stands. Knowing that stem height also affects marketability of leafy vegetables, it is interesting that competition with *C. benghalensis* caused such marked losses in the market value of these crops.

Leaf fresh weight and stem fresh weight follow the same trend as those of stem height and leaf area.

Table 1: Growth of *Solanum macrocarpon* and *S. aethiopicum* due to interference from *Commelina benghalensis.*

Weed Competition Duration	No. of leaves	Leaf area (cm^2)	Stem height (cm)	Shoot wt. at harvest(g) [marketable yield]
		Solanum macrocarpon		
D0 [Weed Free]	15.00 a	386.75 a	30.88 a	47.40 a
D1 [Weedy for 2 wks]	14.50 a	387.75 a	22.85 b	44.74 a
D2 [Weedy for 4 wks]	10.75 b	204.50 b	20.88 b	32.32 b
D3 [Weedy for 6 wks]	7.75 b	159.00 c	18.80 c	25.62 b
D4 [Weedy for 8 wks]	12.75 a	139.00 c	16.00 c	24.14 b
		Solanum aethiopicum		
D0 [Weed Free]	10.75 a	373.95 a	50.03 a	56.65 a
D1 [Weedy for 2 wks]	9.25 b	350.93 a	63.28 a	55.00 a
D2 [Weedy for 4 wks]	9.00 b	292.65 b	29.00 b	31.22 b
D3 [Weedy for 6 wks]	8.00 c	246.05 b	26.50 b	21.90 c
D4 [Weedy for 8 wks]	8.25 c	157.38 c	21.50 b	18.82 c

Values followed by the same letters along the column are not significantly different from each other.

Table 2: Mean square for the growth parameters of *Solanum macrocarpon* and *S. aethiopicum* due to interference from *Commelina benghalensis.*

Sources of variation	df	No. of leaves	Leaf area	Stem height	Shoot weight
		Solanum macrocarpon			
Treatment	4	773.44 *	384475.88 *	2520.69 *	6532.52 *
Error	15	183.94	81483.09	611.95	1494.61
		Solanum aethiopicum			
Treatment	4	414.19 *	433938.47 *	8512.86 *	8042.06 *
Error	15	98.92	97309.41	1772.74	1558.98

* - significant at 5% probability level

Increase in competition duration resulted in pronounced reduction in leaf and stem fresh weights. Cumulatively, there was a 49.1% decrease in shoot fresh weight in *S. macrocarpon* and a 66.8% decrease in *S. aethiopicum*. These yield reductions would make cultivation of both species unprofitable in lands prone to infestation by *C. benghalensis*.

Competition for two (2) weeks had no significant effect in all parameters measured but interference for four (4) weeks resulted in significant reductions in these parameters. This suggests that the removal of *C. benghalensis* should be carried out within the first four weeks of transplanting the two vegetable crops on a plot infested by this weed. Any delay beyond the fourth week would lead to drastic yield losses. Beyond the 6th week of transplanting, the level of interference is so intense that the yield is nearly as poor as that for completely weedy stands. Since the pots were kept weed free after the duration of the competition stress, it is informative to note that crops in the 4 week and 6 week competition duration

Table 3: Percentage reductional effect of *Commelina benghalensis* on the growth parameters of *Solanum macrocarpon* and *S. aethiopicum*.

Weed Competition Duration	No. of leaves	Leaf area (cm^2)	Stem height (cm)	Shoot wt. [marketable yield reduction]
Solanum macrocarpon				
D0 [Weed Free]	-	-	-	-
D1 [Weedy for 2 wks]	3.33	0.26+	26.00	5.61
D2 [Weedy for 4 wks]	28.33	47.12	32.38	31.81
D3 [Weedy for 6 wks]	48.33	58.89	39.12	45.95
D4 [Weedy for 8 wks]	15	64.06	48.19	49.16
Solanum aethiopicum				
D0 [Weed Free]	-	-	-	-
D1 [Weedy for 2 wks]	13.95	6.16	26.48+	2.91
D2 [Weedy for 4 wks]	16.28	21.74	42.03	44.89
D3 [Weedy for 6 wks]	25.58	34.20	47.03	61.34
D4 [Weedy for 8 wks]	23.26	57.91	57.03	66.78

+ - values greater than control

failed to recover fully from the competitive stress even though they were kept weed free for 8 and 6 weeks respectively. The yield losses induced by the competition were not only severe but were also irreversible. The results of these experiments suggest that *S. macrocarpon* and *S. aethiopicum* are probably highly sensitive to interference from other plant species. As these potherbs are often grown in mixed stands with other crops, it would be interesting to know the yield responses of both vegetables in mixed cropping systems. It is probable that both crops do not attain their optimum yield in such mixtures.

REFERENCES

Edwards, K.D. (1974). *Weed control within maize and wheat in Southern Highlands of Tanzania.* Proceedings of the 5th East Africa Weed Control Conference, Nairobi, Kenya. pp.25-34.

Eastenes, A. B. (1972). *Weed control in Relatorio Annual.* Instiute de Investigacao Agronomica de Mozambique. pp. 26-30.

Gbile, Z. O. (1981). Indigenous African Vegetables. Invited paper presented at the 6th African Horticultural Symposium, Ibadan, Nigeria. *ACTA Horticulture*. pp.71-73.

Gbile, Z. O. (1984). *Vernacular names of Nigerian plants*. Forestry Res. Inst. Nigeria (FRIN), Ibadan. pps. 33 & 57.

Ghosh, A. K. (1978). *Efficiency of herbicides for upland rice, applied either alone or in mixtures*. Proceedings of the 6th East African Weed Science Conference, 176-186.

Grubben, C.J.H. (1977). *Tropical Vegetables and their genetic resources*. F.A.O., Rome. 197pp.

Ivens, G.W. (1967). *East African weeds and their control*. Oxford Univ. Press, Nairobi. pp. 101-102.

Moody, K. (1983). Weeds in upland rice in the Philippines. In: *Weed management in the Philippines,* Walter (ed.). Onstitute for Pfeazen production in den tropen and suptropen. University of Hohenhein, Staffgart, Germany. pp. 81-86.

Norman, J.C. (1972). Tropical leafy vegetables in Ghana. *World Crop* **24(4)**: 217-219.

Ray, B.R. (1972). Weed control in rice-A review. *Indian J. Weed Science* **5(1)**: 60-72.

Wetala, M.P.E. (1978). Weed control in Soybean [*Glycine max* (L.) Merill.]. Proceedings of the 6th East African Science Conference. pp. 141-156.

Wilson, A.K. (1981) Commeliaceae – A review of distribution of biology and control of the important weeds belonging to this family. *Tropical Pest Management* **27(3)**: 405-418.