Short Communication

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ALLELOPATHIC EFFECT OF AQUEOUS EXTRACTS OF *CALOTROPIS PROCERA* ON GERMINATION AND SEEDLING GROWTH OF MAIZE

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The effects of 24 and 48 h leaf extracts of *Calotropis procera* on radicle and plumule growth of four cultivars of maize (Oba Super I, II, III and IV) were examined. Both extracts demonstrated considerable inhibitory effects on the growth of radicle and plumule of the cultivars and the severity of the inhibition was observed to increase with the increase in the duration of the extraction.

The growth of Oba Super 1 tends to be the least inhibited while the growth of Oba Super III appeared to be mostly inhibited by the extracts when the growth and development of their radicle and plumule were compared to those of the control.

The study concluded that allelopathy might have played a major role in the suppressive ability of this weed on the seedling growth of maize.

Calotropis procera, a member of Asclepiadaceae (Olorode 1984), is one of the most prominent weeds in the Savanna zone of Nigeria, where it constitutes a menace to cowpea, guinea corn and maize farms. Field observations have revealed a significant reduction in yields from the farms, where this weed is found.

Previous studies, such as (Evanari 1949; Rice 1984) among others, had revealed that most weeds affect their neighbours by releasing allelochemicals, which inhibit the growth of their neighbours directly or indirectly by altering the physical and chemical characteristics of the soil and the availability of nutrients, pH, total phenolic levels and microbial population (Blum & Shaffer 1988; Inderjit & Dakshini 1992, 1994).

Therefore, there is a growing interest in the study of allelopathy among weed scientists and plant ecologists in the recent time. The study being reported here aimed at determining the inhibitory potentials of the extracts of *C. procera* on the germination and seedling growth of maize, a widely cultivated crop in Nigeria.

Maize seeds from four cultivars, namely Oba Super I, II, III and IV, were obtained from the International Institute for Tropical Agriculture, Ibadan, Nigeria and used in this study.

Leaves of *Calotropis procera* were collected along Ilorin - Jebba road in the Savanna region of Nigeria. 500 g of fresh leaves were soaked in one litre of distilled water for a period of 24 h. Another 500 g were soaked for 48 h. The solutions were filtered and the filtrate was used as aqueous extracts.

Sterilized petri- dishes were double - layered with Whatman No.1 filter papers. Five seeds of the respective cultivars were placed in each petri - dish. The petri - dishes were moistened daily with the 24 and 48 h, aqueous extracts of the leaves of

Table 1

Effect of aqueous extracts of *C. procera* on the radicle and plumule lengths (cm) of maize cultivar Oba Super I

Plant parts	Extract time (h)	Experimental time (h)*						Average % decrease
		24	48	72	96	120	144	
	Control	-	1.30	3.92	5.73	6.95	8.05	-
Radicle	24	-	0.95 (26.90)	1.08 (72.40)	2.95 (48.50)	4.01 (42.30)	5.27 (34.50)	- (44.90)
	48	-	0.56 (56.90)	0.92 (76.50)	1.45 (74.70)	3.24 (53.40)	4.01 (50.20)	- (62.30)
	Control	-	1.20	1.31	2.38	2.98	3.68	-
Plumule	24	-	- (100.00)	0.51 (61.10)	0.97 (59.20)	1.21 (59.40)	1.88 (48.90)	- (65.70)
	48	- -	- (100.00)	0.31 (76.30)	0.53 (77.70)	0.71 (73.50)	1.06 (71.20)	- (79.70)

* Figures in brackets represent the % decrease over control.

Table 2
Effect of aqueous extracts of C. *procera* on the radicle and plumule lengths (cm.) of maize cultivar Oba Super II

Plant parts	Extract time (h)	Experimental time (h)*						Average % decrease
		24	48	72	96	120	144	
	Control	-	1.40	3.98	6.92	9.01	10.89	-
Radicle	24	-	0.72	1.51	2.01	3.96	4.75	-
			(48.60)	(62.10)	(71.00)	(56.00)	(56.40)	(58.80)
	48	-	0.56	0.98	1.75	2.57	3.01	-
			(60.00)	(75.40)	(74.70)	(71.50)	(72.40)	(70.80)
	Control	-	1.36	1.98	2.58	3.30	4.02	-
Plumule	24	-	-	0.52	0.98	1.08	1.73	-
		-	(100.00)	(73.70)	(62.00)	(67.70)	(57.00)	(72.10)
	48	-	-	0.23	0.38	0.91	1.22	-
		-	(100.00)	(88.40)	(85.30)	(72.40)	(69.70)	-

* Figures in brackets represent the % decrease over control.

Table 3
Effect of aqueous extracts of C. *procera* on the radicle and plumule lengths (cm) of maize cultivar Oba Super III

Plant Parts	Extract time (h)	Experimental time (h)*						Average % decrease
		24	48	72	96	120	144	
	Control	-	0.28	1.86	3.27	4.01	4.78	
Radicle	24	-	-	0.21	0.53	0.99	1.32	
		-	(100.00)	(88.70)	(83.30)	(75.90)	(72.40)	(89.10)
	48	-	-	0.14	0.25	0.48	0.96	
		-	(100.00)	(92.50)	(92.40)	(88.00)	(79.90)	(90.60)
	Control	-	0.34	0.78	1.82	2.65	3.12	
Plumule	24	-	-	-	0.25	0.51	1.05	
		-	(100.00)	(100.00)	(86.30)	(80.80)	(66.30)	(86.70)
	48	-	-	-	0.23	0.49	1.03	
		-	(100.00)	(100.00)	(87.40)	(81.50)	(67.00)	(87.20)

* Figures in brackets represent the % decrease over control.

C. procera. Each treatment was replicated five times. A control treatment was also set up and moistened daily with distilled water.

The petri - dishes were kept at room temperature in a growth chamber where germination measurements were recorded at 24 h intervals. The results obtained from the extract - treated seed were compared statistically to those obtained from the control experiment.

The results of the different aqueous extracts of the leaves of *C. procera* on radicle and plumule growth of maize are shown in Table 1 - 4. Both 24 and 48 h extracts demonstrated considerable inhibitory effects on the growth of radicle and plumule of the maize cultivars. The severity of the inhibition was more pronounced at 48 h extract time than those of the 24 h extract time.

Results obtained from all the cultivars tend to follow the same trend. The growth and development of the radicle and plumule decreased with the increase in the duration of the extraction. Statistical analyses revealed that these reductions were significantly different when compared to the control at 5% level.

The radicle of Oba Super I was least affected by the extracts,

Table 4
Effect of aqueous extracts of C. *procera* on the radicle and plumule lengths (cm) of maize cultivar Oba Super IV

Plant Parts	Extract time (h)	Experimental time (h)*						Average % decrease
		24	48	72	96	120	144	
	Control	-	1.29	2.85	5.10	6.25	7.20	
Radicle	24	-	0.36	0.87	1.35	2.10	2.85	
		-	(72.10)	(69.50)	(73.50)	(66.40)	(60.40)	(68.40)
	48	-	0.30	0.76	1.28	1.96	2.30	
		-	(76.70)	(73.30)	(74.90)	(68.60)	(68.10)	(72.30)
	Control	-	1.76	2.99	3.36	3.96	4.26	
Plumule	24	-	-	0.32	0.89	1.28	1.96	
		-	(100.00)	(89.30)	(73.50)	(67.70)	(54.00)	(76.90)
	48	-	-	-	0.30	0.71	1.32	
		-	(100.00)	(100.00)	(91.10)	(82.10)	(69.00)	(88.40)

* Figures in brackets represent the % decrease over control.

as the percentages decrease over the control were 44.90 and 62.30 at 24 h and 48 h extracts, respectively (Table 1). Radicle that mostly inhibited was of Oba Super III with the percentages decrease of 89.10 and 90.60 at 24 h and 48 h extracts, respectively (Table 3). The percentages decrease of the radicle of Oba Super II and Oba Super IV were 58.80 and 70.80, 68.40 and 72.30 at 24 h and 48 h extracts, respectively.

The inhibition of the growth and development of the plumule also followed the trend above. Oba Super I tends to be the least inhibited at both 24 h and 48 h extract (Table 1) while Oba Super III appeared to be the most inhibited at both 24 h and 48 h extract (Table 3). Plumule inhibition was above 70% when compared to the controls at both 24 and 48 h extracts in Oba Super II and IV (Tables 2 and 4).

The role of allelopathy in the spatial distribution of weeds cannot be over - emphasized. The latex exudates some of the members of the genus *Calotropis* which has been found to contain a strong allelochemical called Calotropin (Watt & Breyer - Brandwijk 1962; Bouguent 1972; Daubenmire 1974). This compound might be responsible for the inhibitory effects demonstrated in this study by this weed.

Allelochemicals, though present in all plants parts, have been found to be mostly concentrated in the leaves. For example, studies had revealed that the allelochemicals present in *Chromoleana odorata,* (Ogbe *et al* 1991; Gill *et al* 1993), *Setaria faberii* (Bell & Koeppe 1972), *Cyperus rotandis* (Alams & Azini 1991) and *Euphorbia heterophylla* (Tijani - Eniola & Fawusi 1989; Kayode 1998) were concentrated in their leaves. The leaf extracts from these weeds, irrespective of the duration of extraction, inhibited germination and seedling growths in *Zea mays*, *Vigna unguiculata*, wheat, tomato and cowpea, respectively.

In conclusion, Idu & Omonhinmin 1998 had shown that the degree of inhibition demonstrated by extracts from the different component parts of *C. procera* were similar. Thus, it could be suggested that allelopathy might have played a prominent role in the spatial distribution and suppressive ability that this weed exerts on neighbouring plants in the field.

***Key words*:** Allelopathy, Inhibition, *Calotropis procera*, Radicle, Plumule.

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