COMUNICACIONES

The effect of weed competition on the growth and nutrient content of oil palm seedlings[1] /

Resumen. Se sembraron en bolsas de polietileno semillas brotadas de palma de aceite. El desyerbe de las mismas y de los alrededores se realizó a cuatro, ocho, y 20 semanas después de la siembra. Posteriormente, se desyerbaron a intervalos de dos, cuatro, seis y ocho semanas.

Las prácticas de demorar el primer desyerbe e incrementar los intervalos entre desyerbes subsecuentes restringieron el crecimiento de la palma. Los porcentajes de N, P, K, Mg y Ca en las hojas, tallos y raíces de las plántulas no fueron afectados significativamente por los diferentes tratamientos de desyerbar. Sin embargo, el contenido de estos nutrimentos en las plántulas enteras fue disminuido tanto por el hecho de demorar el primer desyerbe como por extender los intervalos entre subsecuentes desyerbes.

There is scant information on the effect of weeds on the nutrient content of oil palm seedlings. This aspect of weed-crop competition is important because of the metabolic roles of nutrients in crop growth. Incidence and/or a reduction in either light, water or nutrients available to the crop could result in decreased crop growth and yield (3, 8). Weeds generally accumulate considerable amount of nutrients at the expense of cultivated crops whose yields thus fall, particularly when the soil content of these nutrients is low (7, 9).

El-Shafey, El-Hattab and Monged (4) reported that N content of weeds associated with maize was highest when N fertilization was not done, while the mineral content of maize generally increased with an increasing level of nitrogen fertilization. They attributed this to rapid growth of maize under high N levels which suppressed the associated weeds. Aya (1) found that a pure culture of *Amaranthus spinosus* L. in competition with polybag oil palm seedlings decreased the growth of the latter by interfering with the efficiency of water and fertilizer utilization by the seedlings. Also, delayed weeding of the *A. spinosus* beyond 16 weeks after sowing irreversibly retarded oil palm seedling growth.

Handweeding with simple tools like hoes and machetes is usually employed in weed control in peasant agriculture in Nigeria, although herbicidal control is practised in government agricultural research institutes and plantations. Handweeding requires that the weeds be allowed to grow to a size suitable for easy removal, which usually results in delayed weeding and yield losses. In Nigeria, handweeding the polybags as well as the intervening ground at intervals of two-four weeks, starting about four weeks after sowing, is practised in oil palm nurseries. This study reports on how long the initial and subsequent weedings could be delayed without adverse effect on the growth and nutrient content of oil palm seedlings.

Materials and methods

A randomized – block experiment with split plots and three replications was conducted at the nursery of the Nigerian Institute for Oil Palm Research (NIFOR). Sprouted oil palm seeds were sown on May 28, 1980 in black polybags (35 x 40 cm, 0.013 gauge) filled with nursery top soil and spaced 45 cm apart. Weeding of the polybags and surrounding ground was delayed for four, eight, 12, 16 and 20 weeks after sowing (main plots). Thereafter, weeding was carried out at two, four, six and eight week intervals (subplots). Plot size was 5 x 7.7 m and both the polybags and the intervening ground were weed-free at sowing. Routine nursery cultural practices for the oil palm, including fertilizer application, were carried out as outlined by Gunn, Sly and Chapas (5).

The weeds from both the polybags and the ground were handpulled at each weeding treatment and oven-dried to constant weight. The cumulative dry weights for the weeds are given in Tables 1 and 2. The experiment was terminated 12 months after sowing and 10 seedlings were sampled from each subplot for the determination of dry weights of leaf, stem and roots and of percentage of nutrient content. The nursery and laboratory procedures for these were similar to those described by Iremiren (6).

Data collected were subjected to a split-plot analysis of variance from which the various standard errors of the means were calculated.

Results and discussion

The predominant weeds observed in the experimental site were *Celosia trigyna* L., *Oldenlandia corymbosa* L., *Ageratum conyzoides* Linn., *Talinum triangulare* (Jacq.) Willd, *Digitaria horizontalis* Willd., *Phyllantus niruri* L. and *Portulaca oleracea* Linn. These formed canopies which, to different degrees, enclosed the oil palm seedlings when time of first weeding was delayed until 12, 16 and 20 weeks after sowing, but not in the other weeding treatments. Weed occurence was significantly increased ($P < 0.001$) by both successive delays in time of first weeding and increasing weeding intervals (Tables 1 and 2).

A reduction in the growth of the leaf, stem and root fractions and whole seedling dry weight occurred with both delayed times of initial weeding and increasing weeding intervals (Tables 1 and 2). The decreased growth was significant only in the leaf fraction ($P < 0.001$ for main plot; $P < 0.05$ for subplot). The decrease in whole seedling dry weight with increased weed competition was significant ($P < 0.01$) only when initial weeding was delayed until 20 weeks after sowing. This supports the Aya's results (1), in which *A. spinosus* in competition with oil palm seedlings irreversibly retarded the growth of the latter only when initial weeding was delayed beyond 16 weeks after sowing.

Table 1. Effect of time of first weeding on distribution of dry matter in oil palm seedling at 12 months (g/plant) and cumulative dry weight of weeds (g/m² land).

	Time of first weeding (wk)					
	4	8	12	16	20	S.E. ±
Leaf	101.0	97.8	95.2	72.2	43.8	7.4
Stem	49.8	49.2	38.2	47.9	24.6	7.8
Roots	34.2	30.7	26.6	25.2	21.3	4.1
Whole seedling	185.0	177.7	160.0	145.3	89.7	14.9
Weeds	275.0	322.1	691.4	841.8	142.4	83.9

Table 2. Effect of weeding intervals on distribution of dry matter in oil palm seedling at 12 months (g/plant) and cumulative dry weight of weeds (g/m² land).

	Weeding intervals (wk)				
	2	4	6	8	S.E. ±
Leaf	100.8	83.9	77.5	65.8	10.2
Stem	48.8	36.2	42.0	40.8	6.1
Roots	29.8	26.9	28.7	25.0	3.4
Whole seedling	179.4	147.0	148.2	131.6	17.4
Weeds	508.6	600.6	640.3	868.6	36.3

The percentages of N, P, K, Mg and Ca in the leaf, stem and root fractions respectively were not significantly affected by increased weed competition arising from the delay in the time of first weeding and the increasing weeding intervals (Tables 3 and 4). However, this was not so for whole seedling content of N, P, K, Mg and Ca (Tables 5 and 6). Delay in time of first weeding significantly decreased whole seedling content of all thse nutrients except N, while decreases arising from longer weeding intervals were not significant. The decrease in general seedling nutrient content has more to do with the weeds' effect on seedling dry weight than with a reduction in the percentage of nutrient concentration. This is because weed competition was severe enough to affect seedling dry weight, but not the percentages of N, P, K, Mg and Ca in the seedlings. There were no significant interactions between the time of initial weeding and weeding intervals for all the parameters studied.

The non-significant effect of weed competition on nutrient concentration in plant material may be due to competition between oil palm seedlings and weeds was for light or possibly water, rather than for mineral nutrients. Competition for light was patent when time of first weeding was delayed for 12, 16 and 20 weeks after sowing because the canopies formed by the weeds completely enclosed the seedlings. Such competition for light was not detrimental to the growth of the oil palm seedlings, except when weeding was delayed for 20 weeks, as they recovered after initial weed removal (Table 1). Competition for water was probable in the dry season (December-March), only in subplot treatments, as all the weedings in the main plot treatments occurred during the rainy season (May-November), before the onset of the dry period. The lack of any significant effect on nutrient concentration caused by weeds might also be due to the fact that reduction of whole seedling dry weight with various weeding treatments occurred over a range where nutrient concentration was barely affected, as illustrated by Bates (2).

In conclusion, the results from this study show that initial weeding of polybags and the surrrounding ground delayed beyond 16 weeks after sowing significantly reduced oil palm seedling growth, while weeding intervals up to eight weeks did not. Weed competition had no significant effect on nutrient concentration in plant parts.

Table 3. Effect of time of first weeding on nutrient content of plant parts (%).

Nutrients	Time of first weeding (wk) 4	8	12	16	20	S.E. ±
Leaf						
N	1.07	1.07	1.04	0.94	1.03	0.07
P	0.18	0.18	0.18	0.19	0.20	0.01
K	1.42	1.45	1.38	1.14	1.41	0.11
Mg	0.47	0.46	0.44	0.44	0.47	0.03
Ca	0.67	0.71	0.70	0.62	0.64	0.04
Stem						
N	1.69	1.58	1.37	1.16	1.56	0.27
P	0.34	0.31	0.32	0.31	0.34	0.03
K	1.56	1.63	1.43	1.30	1.47	0.10
Mg	0.43	0.44	0.43	0.40	0.40	0.02
Ca	0.59	0.59	0.53	0.53	0.53	0.02
Roots						
N	1.00	0.82	0.93	0.89	1.03	0.07
P	0.14	0.11	0.12	0.12	0.13	0.01
K	1.50	1.55	1.61	1.63	1.59	0.09
Mg	0.09	0.07	0.09	0.09	0.08	0.01
Ca	0.47	0.48	0.48	0.50	0.52	0.03

Table 4. Effect of weeding intervals on nutrient content of plant parts (%).

	Weeding intervals (wk)				
Nutrients	2	4	6	8	S.E. ±
			Leaf		
N	1 10	1 03	0 99	1 01	0 06
P	0 19	0 18	0 19	0 19	0.01
K	1 33	1.20	1 35	1 57	0 14
Mg	0 43	0 45	0.45	0.50	0 04
Ca	0 66	0 62	0 69	0 71	0.03
			Stem		
N	1 45	1 49	1 36	1.57	0 16
P	0 32	0 34	0.32	0.32	0 03
K	1 46	1 56	1.55	1.35	0.10
Mg	0 43	0.46	0.41	0 39	0 03
Ca	0.56	0 56	0 55	0 55	0 02
			Roots		
N	0 92	1.00	0 93	0.90	0.06
P	0 13	0 13	0.12	0.13	0.01
K	1 66	1 54	1 49	1 61	0.11
Mg	0 08	0 09	0 07	0 09	0 01
Ca	0.52	0 48	0 47	0 49	0 02

Table 5. Effect of time of first weeding on nutrient content of whole seedling (g/plant).

	Time of first weeding (wk)					
Nutrients	4	8	12	16	20	S.E. ±
N	2 26	2.07	1.76	1.50	1 07	0 27
P	0 40	0 37	0 34	0.30	0 19	0.04
K	2 65	2 72	2 31	1 82	1 29	0.23
Mg	0 71	0 67	0 60	0.53	0 30	0.06
Ca	1 12	1 14	0 99	0 83	0 52	0 09

Table 6. Effect of weeding intervals on nutrient content of whole seedling (g/plant).

	Weeding intervals (wk)				
Nutrients	2	4	6	8	S.E. ±
N	2.12	1 66	1 61	1.53	0.23
P	0 38	0 31	0 32	0.28	0.04
K	2.53	1 96	2 15	1 99	0.30
Mg	0 67	0.55	0 54	0.49	0 07
Ca	1.10	0.85	0 90	0 83	0.10

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pH and acidity of home-canned tomatoes

Resumen. Se estudiaron la calidad y la seguridad sanitaria de tomates de la producción local en Río Colorado, Argentina, envasados en forma casera, a través de la determinación del pH y acidez titulable. Se describen los procedimientos de envasado utilizados en la región para preservación de tomate. Aún para los máximos valores de pH observados, la acidez total inhibe el desarrollo de *Clostridium botullinum*.

Tomatoes are harvested from September to February, depending on the different varieties and climatic characteristics of the country in question. Much of the production is sold fresh, and a large amount is canned by industries, but a considerable quantity is still home-canned, according to long-standing practices.

This home-canning procedure usually involves the use of heat to kill bacteria, molds and yeasts that cause spoilage of the product. In case of sporulated bacteria (e.g. *Clostridium botulinum*), the acidity of the tomato inhibits growth and development.

While the home-canning process for tomatoes has occasionally resulted in outbreaks of botulism, the incidence of outbreaks is negligible when compared with botulism caused by other preserved foodstuffs, and when one considers the great quantity of jars of tomatoes which are preserved annually at home.

pH and acidity of the samples were recorded to evaluate the quality and safety of home-canned tomatoes being grown and processed at Río Colorado, Argentina.

Materials and methods

Several home-canners were asked to contribute to this survey with five bottles of their own production of tomatoes. The samples represented the common processing procedures used, and as additional infor-