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PERFORMANCE OF CASTOR (*Ricinus communis* L) AS INFLUENCED BY PERIOD OF WEED INTERFERENCE IN SAMARU, NIGERIA

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ABSTRACT
A field experiment was conducted during the 2007 and 2008 raining season at the research farm of the Institute For Agricultural Research Samaru in the northern guinea savanna ecological zone of Nigeria to evaluate the Performance of castor (Ricinus communis L) as influenced by various periods of weed interference. The result show that leaving the castor crop weed free for 6 WAS and beyond and weed infested for 3 WAS gave significantly higher stand count which was statistically similar to crop kept weed infested for 6 and 9 WAS. All The periods of weed interference produce tall plants which were also comparable with each other. Crop dry matter was significantly increased by all the treatments except crop kept weed free for 6WAS.

KEYWORDS: Castor, Period of weed interference etc.

INTRODUCTION

The use of vegetable oil particularly in the transportation sector as a bio-diesel has gained importance worldwide. A number of oil seed crops have been identified as alternative compliment to fossil fuel for energy supply. Castor whose botanical name is Ricinus communis is one of the prospective bio-diesel yield crops (bio-energy 2007). Significant advantage of castor compared to other oil seeds crops include very high oil content, nematocidal effects of the oil, high seed yield and superior quality of the oil/ diesel produced (Horton et al 2006). Other uses of castor oil is in the manufacturing of all purpose grease, hydraulic fluids, artificial leather, pharmaceuticals, soap, printing ink, special low temperature lubricants and flexible coating. In Nigeria, the seed is fermented severally and detoxified to obtain a seasoning agent (Uzogara et al 1990) which is used as a condiment in soups, salads and to enhance food flavor. (Onyeike and Onwuka, 1999).

Castor seed yield has been reported to be between 1.5-2.0 tonnes/ha. (Bonjean, 1991). Various reasons have been attributed for the low productivity among the most important are weed competition and farming techniques like hoe weeding. Anon (2008) reported that the first 4 weeks after emergence in weed infested farm could cause 10–15% yield loss. Despite the importance of this plant there has been limited research work carried out on the crop in Nigeria to increase the crop competitive ability, it is necessary to know the stage at which the crop is more susceptible to weed. This will enable the farmer to weed before the weeds become detrimental to the crop. In the light of the above, the study was designed to determine the stage at which the crop is more susceptible to weeds and intervention at such period will go a long way in reducing the frequency of weeding before the canopy of the crop is formed wide enough to suppress weed thus reducing cost of production.

MATERIALS AND METHODS

Field experiment was conducted on the research farm of the Institute for Agricultural Research Samaru (11^0 11N$^{\cdot}$, 07^0 38'E and 686m above sea level) in the Northern Guinea Savanna of Nigeria during the wet season of 2007 and 2008. The treatments consist of one variety of castor (small seeded) and ten periods of weed interference (weed free for 3, 6, 9, 12 WAS and till harvest and weed infested for 3, 6, 9, 12 WAS and till harvest). The treatments were laid out in Randomized Complete Block Design (R C B D) with three replications. The gross and net plot sizes were 6 x 4m (8 ridges of 4m length) and 4 x 4m (4ridges of 4m length) respectively. Tillage operations consisted of ploughing, harrowing and ridging. Planting was done on the 15th and 19th June in 2007 and 2008 respectively. The physico-chemical characteristics of the soil of the experimental sites are presented in Table 1. Annual total rainfall received during the cropping seasons was 926.3 and 1139.9mm respectively. Five seeds of castor were sown at spacing of 75cm inter-row and 50cm intra row per hill and subsequently thinned to one plant per hill after five weeks. Five plants were randomly tagged from the net plot and used for data collection. Fertilizer was applied at the rate of 90kg N, 30kg P and 30kg K/ ha $^{-1}$ in each season. All the P and K and half of the N were applied at planting to burst the growth of the crop using NPK 15:15:15. The second split dose of N was applied at 6 WAS using urea.

Data collected include weed dry weight (WDW), stand count, plant height, crop dry matter, seed yield and 100-seed weight of castor. The data were subjected to analysis of variance (ANOVA) (Snedecor and Cochran, 1967), where significance was observed among treatment means they were separated using Duncan Multiple Range Test (DMRT) as described by Duncan (1955).

RESULTS

Effect of period of weed interference on weed

From the results obtained, weed dry weight and stand count of castor was significantly affected by period of weed interference at 9WAS in both years of study. Crop kept weed free for 3 and 6 WAS and weed infested up till 12 WAS and till harvest in 2007 and weed infested till 12WAS in 2008 gave the highest weed dry weight. Crop kept weed free till 9, 12 WAS and till harvest and weed infested till 3, 6 and 9 WAS gave lower and comparable weed dry weight. Keeping castor weed free for 6WAS and beyond and weed infested till 3, 6 and 9 WAS in 2007 and weed free till 6 WAS and beyond and weed infested till 3, 6, 9 and 12 WAS in 2008 gave higher and comparable number of stands (Table 2).

Plant height and crop dry matter of castor was significantly affected by period of weed interference at 9 WAS in 2007, and crop dry matter in both years of study.

Keeping castor weed free till 12 WAS and harvest and weed infested till 3 WAS gave the tallest plants but were comparable to crops kept weed free till 3, 6 and 9 WAS and weed infested till 6, 9 and 12 WAS which were in turn comparable to crop kept weed infested till harvest. Keeping castor plants weed free till 12WAS and till harvest and weed infested till 3 and 6 WAS gave the highest crop dry matter in both years of study. Keeping castor weed infested till harvest gave the lowest crop dry matter but was comparable to crops kept weed free till 3 to 9 WAS in both years of study (Table 3).

Effect of period of weed interference on yield and 100 - seed weight

Seed yield and 100 seed weight of castor were significantly affected by period of weed interference weight in 2007 only.

Crop kept weed free till 12 WAS and harvest and weed infested till 3 WAS gave the higher seed yield but was comparable to crop kept weed free 6 and 9 WAS and weed infested 6, 9 and 12 WAS. Castor left weedy till harvest gave the lowest seed yield.

Castor kept weed free for 12 WAS and beyond and weed infested till 3 WAS gave the heavier 100-seeds than all the other periods of weed interference. This was followed by crops kept weed free and weed infested till 6 and 9 WAS. Keeping the crop weed infested till 12 WAS and harvest gave the lowest 100-seed weight (table 4).

DISCUSSION

The lower weed dry weight, higher stand count, taller plants, higher crop dry matter, higher seed yield and heavier 100-seeds weight observed when castor was kept weed free from 6 WAS and beyond and weed infested for 3 and 6 WAS could be due to the fact that at this stage couple with good land preparation the crop had adequate nutrient since competition with weeds is minimal. It is also possible that at this stage the crop canopy is wide enough to shade weeds thus the slow emergence and early growth of castor. This means that the castor is not a strong competitor against weeds at the initial growth stage.

Keeping the crop weedy for 12 WAS and beyond caused decrease in the ability of the crop to grow and produce well as a result the crop supported high weed dry weight and lower stand count of castor. Castor left weedy for 9 WAS still produced comparable with those left weedy for 3 and 6 WAS because at this stage the canopy of the crop is able to suppress weeds which becomes etiolate as a result of the shading effect. Second flushes of broad leaved weeds or moderate infestations which emerged after the crop, probably will not compete effectively under an advanced crop canopy (Shinggu, 2007). Stand count was higher in 2007 than 2008. The difference could be as a result of the slow germination of castor seeds together with the rain problems observed in the season. Some of the seeds germinated well after 21 days of plant which is the recommended germination period of the crop (Oplinger, 1997).

CONCLUSION

In this study, weed infestation of castor up till 9 WAS did not have significant effect on growth and yield parameters. This means that with good land preparation you can weed your field at 9 WAS thus reducing cost of production.

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TABLE 1: Physico-chemical properties of soils at the experimental sites during the 2007 and 2008 wet season at Samaru, Nigeria.

Season	2007	2008
Soil depth (cm)	0 - 30	0 - 30
Soil characteristics		
Physical compositions (%)		
Sand	4	5.6
Silt	35	32
Clay	12	12
Textural class	Sandy	
Chemical composition		
pH in H_2O (1:2:5)	5.4	5.65
pH in 0.01 MCaC12 (1:2:5)	5.0	4.40
Organic carbon (%)	0.08	0.05
Available Phosphorus (PPM)	6.72	3.8
Total Nitrogen (%)	7	3.81
SE ±	0.05	0.05
Exchangeable Bases (Mol/kg)		
Ca	3.35	3.27
Mg	0.72	0.72
K	0.31	0.29
Na	0.39	0.11
CEC	5.30	5.58

Source: soil science Department, Ahmadu Bello University, Zaria, Nigeria.

TABLE 2: Effect of period of weed interference on weed dry weight and stand count of castor at Samaru, Nigeria during the 2007 and 2008 rainy seasons at Samaru, Nigeria.

Treatments	Weed dry weight (g/m2)		Stand count	
	2007	2008	2007	2008
Weed free till				
3wks	88.90a[2]	26.67bc	30bc	6abc
6wks	82.17a	23.00bc	58a	9a
9wks	59.70b	26.33bc	59a	01d
12wks	54.00b	45.00bc	58a	6abc
Harvest	77.27b	24.67bc	59a	6abc
Weed infested till				
3wks	11.53b	47.33bc	64a	7ab
6wks	10.27b	32.33bc	54a	4bcd
9wks	58.67b	13.00c	49a	7ab
12wks	84.23a	91.33a	26bc	7ab
Harvest	86.57a	103.33a	16c	2bcd
SE ±	29.211	16.134	11.646	1.564

1. Weeks after sowing
2. Means followed by the same letter(s) within a column is/are not significantly different at P=0.05 using DMRT

TABLE 3: Effect of weed interference on plant height and crop dry matter of castor at Samaru, Nigeria during the 2007 and 2008 rainy seasons

Treatments	Plant height (cm)		Crop dry matter (gm)	
	2007	2008	2007	2008
Weed free till				
3wks	67.33ab[2]	56.00	80.33bcd	10.43d
6wks	69.33ab	56.00	65.67bcd	11.18c
9wks	71.00ab	48.33	67.67bcd	11.63b
12wks	93.00a	44.33	191.33a	12.34a
Harvest	104.00a	65.00	180.00a	12.12a
Weed infested till				
3wks	99.33a	51.67	192.67a	12.68a
6wks	81.67ab	54.33	123.00abc	11.79a
9wks	61.33ab	65.00	75.67bcd	10.68cd
12wks	67.67ab	74.33	23.67cd	10.88cd
Harvest	39.00b	69.00	7.00d	9.93e
SE ±	7.663	13.292	18.002	0.140

1. Weeks after sowing
2. Means followed by the same letter(s) within a column is/are not significantly different at P=0.05 using DMRT

TABLE 4: Effect of period of weed interference on grain yield and 100- seed weight of castor at Samaru, Nigeria during the 2007 and 2008 rainy seasons.

Treatments	Grain yield		100-seed weight	
	2007	2008	2007	2008
Weed free till 3wks	337.7bc[2]	104.3	9.77b	15.33
6wks	690.0abc	149.7	6.57ab	1733
9wks	1483abc	588.0	11.97ab	11.00
12wks	2368a	647.3	15.43	17.67
Harvest	2371a	758.3	15.41a	17.67
SE±	2351a	784.0	16.53a	18.00
Weed infested till				
3wks	1674abc	247	11.37ab	17.67
6wks	888abc	244.3	11.60ab	11.00
9wks	803abc	228	2.80c	17.67
12wks	200d	130.7	4.07c	18.33
SE ±	646.754	277.682	3.038	3.421

1. Weeks after sowing
2. Means followed by the same letter(s) within a column is/are not Significantly different at P=0.05 using DMRT