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EFFECT OF THE CRITICAL PERIOD OF WEED INTERFERENCE ON OPTIMUM PERFORMANCE OF TURMERIC AT UMUDIKE, NIGERIA

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ABSTRACT
A field study was carried out at the National Root Crop Research Institute experimental farm to determine the critical period of weed interference and magnitude of yield loss caused by weed on turmeric in 2008 and 2009 cropping season. Turmeric was subjected to 13 weeding regimes using randomized complete block design with 3 replications. The result showed that turmeric rhizome yield was significantly affected by weeding regime in both years. Yield was found to be increasing as plots were kept weed free up to 12 weeks after planting (WAP) implying that turmeric should be weed free first 12weeks to avoid drastic yield reduction. Under the weed intensity, weeding at 8week after planting (WAP) produced the highest yield of Turmeric rhizome. On the other hand, delayed weeding beyond the 8weeks after planting (WAP) resulted in a noticeable yield depression in turmeric. This implied that the critical period of weed interference was between 8-12weeks after planting (WAP).

Key words: critical period, weed interference, Turmeric

INTRODUCTION
. Turmeric (*curucumis longa* (Linn) belongs to the family Zingiberaceac and is one of the minor root crops currently under research focus in the institute. In Nigeria it is cultivated mostly in the homestead gardens in about 19 states and given different local names depending on the locality (Olojede *et al* 2005). Turmeric internationally and locally is used as a natural colouring agent for food, cosmetic, or dye and medically for treating various kinds of diseases. It is reach in yellow food pigment called curcuminoid (6%) and essential oils (5%) (Nunes, 1989), and highly valued as major source of foreign exchange in the international market. It has diversified uses. Curcuminiods, the active principles in turmeric-rhizomes, have anti-inflammatory, antimutagen, anticancer, antibacterial, anti-oxidant, antifungal, antiparasitic and detoxifying properties (Sugiyama et al, 1996; Ishimine et al., 2003). Curcumin and volatile oils of turmeric improve liver and kidney functions, and could be used against biliary disorders, diabetic and hepatic disorders (Hermann and Martin, 1991).

India is the largest producer of turmeric supplying 94% of the world's demand (Plant cultures2005). It is cultivated on a commercial scale and exported as dried rhizomes which are later prepared into different forms to meet diverse end uses. In view of the prevailing favourable soil and climatic conditions in Nigeria, the country can play a leading role in turmeric production. Albeit, this potential has not been fully harnessed as the production techniques required are poorly understood hence production have been restricted to homestead garden (Olojede et al, 2005).Turmeric is reported to grow under diverse tropical conditions with altitudes ranging from sea to 1500m above sea level (Rena and Madan 2001) on a well drained sandy or clay loamy soil and temperature ranging between 20-30^{0}C with an annual rainfall of

1500 mm or more. However, the production of turmeric per unit area is very low because of the poor knowledge on proper cultivation technology of the farmers (Ishimine et al., 2003).

Weeds cause reduction in the crop yield and takes extra cost in the total labour use in crop production. Akobundu (1987) stated that weed results in 65% reduction in yield of root and tuber crops and takes 25% of total labour use in production. Weed competition has also been identified as a constraint to root and tuber crop production (Unamma, 1984.) Presently, farmers manually weed root and tuber crops at 4, 8, and 12 weeks after planting in addition to other weed control methods, but such information on Rizga, Turmeric and Hausa potato is not available in Nigeria.. The objectives of this work is to determine the magnitude of yield loss and critical period of weed interference in these crops caused with a view to recommending appropriate time and economic weeding regimes to farmers for efficient production.

MATERIALS AND METHODS

The experiment was conducted at Umudike in 2008 and 2009 cropping seasons using Turmeric as test crop. Two weeding schemes were used. In the first scheme, the crops were kept weed free for specific periods and thereafter allowed to be under weeding for the rest of its growth period while in the second scheme, the crops were kept weedy for a specific periods thereafter, it was weeded for the rest of the growth period There are 13 treatments using randomized complete block design (RCBD) replicated 3 times. Data collected were subjected to statistical analysis using SAS (2008) edition.

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Treatment Combination

WF = Weed free	**W I = Weed Intensity**
T1=0 - 4 (WAP): weed free from 0 - 4 weeks	T7=0 - 4 (WAP): no weeding
T2=0 - 8 (WAP): weed free from 0 - 8 weeks	T8=0 - 8 (WAP): no weeding
T3=0 - 12(WAP): weed free from 0 -12 weeks	T9=0 - 12(WAP): no weeding
T4=0 - 16(WAP): weed free from 0 - 16	T10=0 - 16 (WAP): no weeding
T5=0 - 20(WAP): weed free from 0 - 20	T11=0 - 20(WAP): no weeding
T6=0 - 24(Maturity): weed free from 0 - 24	T12=0 - 24(Maturity): no weeding

T13=Weeding at 4, 8, and 12 WAP – [**Farmers weeding Practice (Control)]**

RESULTS AND DISCUSSION

Plant Height

From the table the maximum plant height in turmeric for both seasons was 70.6cm while the least height was 43.9cm. The maximum height was obtained as weeding regime increased to 16 WAP, while further weeding decreased height implying that beyond this point weeding becomes uneconomical .As for weed intensity weeding turmeric at 8 weeks after planting (WAP) produced the maximum plant height. However, the longer weeding is delayed, the more the reduction in height will be observed. This reduction in height which is as a result of weed will also be translated to reduction in yield , thereby confirming the report of Muoneke et al.(1997) and Njoku et al, (2005) who had reported that taller plants intercepts light more which helps in high yield.

The Mother Leaf Plant was found to be increasing just as the weeding was increasing up to 12 weeks after planting (WAP). At this point the number was highest, but further weeding leads to

decrease in mother leaf number. As for weed intensity weeding at 8 weeks after planting (8WAP) produced the highest number of turmeric mother leaf. However, the more weeding is delayed, the more reduction in the mother leaf number observed. This confirms that weed plays a vital role in crop production and can bring about crop failure where not checked.

For total Rhizome yield Table 3 Turmeric rhizome yield was significantly affected by weeding regime in both years (Table 14). Yield was found to be increasing as the plots were left weed free up to 24 weeks after planting(WAP) with slight depression at 16 and 20 weeks after planting(WA). However, the yield obtained at 24 WAP was not significantly different from that of 12 WAP, and no farmer can weed his farm for 24 weeks after planting that is to maturity. This implies that Turmeric should be kept weed free for the first 12 weeks after planting (WAP) to avoid drastic reduction in yield. Under the weed infested regime, highest rhizome yield was obtained when weeding was delayed up to 8 WAP after which there was general yield reduction with yield reduction ranging between 3 and 55%. The highest yield was obtained at 8weeks after planting (WAP) this implied that first weeding must be carried out latest by 8weeks after planting to forestall yield reduction. Akubundu (1987) stated that weed results in 65% reduction in root and tuber crops, this has been confirmed to be true in these work since in the delayed weeding or no weeding at all showed high reduction in the yield

Table 1 Effect of weeding Regime/Weed Intensity on Plant Height Of Turmeric at Umudike in 2008 and 2009.

Weeding Regime	Plant height (cm)		
Weed free (Wks)	2008	2009	Mean
0 - 4 T1	61.33	58.90	60.11
0 - 8 T2	73.43	64.37	68.90
0 - 12 T3	64.57	62.70	63.60
0 - 16 T4	68.23	72.90	70.56
0 - 20 T5	55.57	62.33	58.95
0 - 24 T6	66.63	68.67	67.65
No weeding (Wks)			
0 - 4 T7	54.77	62.90	58.8
0 - 8 T8	63.67	71.33	67.5
0 - 12 T9	58.57	58.33	58.4
0 - 16 T10	55.00	51.10	53.0
0 - 20 T11	44.23	41.87	43.0
0 - 24 T12	43.90	43.80	43.85
Control T13	67.00	65.57	66.28
LSD	15.72	15.33	

Table 2: Weeding Regime/Weed Intensity on Mother leaf Number of Turmeric in 2008 and 2009.

Weeding Regime	Mother leaf number		
Weed free (Wks)	2008	2009	Mean
0 - 4 T1	6.33	5.33	5.83
0 - 8 T2	9.00	8.33	8.7
0 - 12 T3	9.33	8.33	8.8
0 - 16 T4	10.33	10.00	10.2
0 - 20 T5	8.33	9.33	8.8
0 - 24 T6	9.00	10.33	9.7
Weed Intensity			
No weeding (wks)			
0 - 4 T7	8.00	9.00	8.5
0 - 8 T8	9.60	9.50	9.6
0 - 12 T9	4.33	6.67	5.5
0 - 16 T10	4.33	5.00	4.7
0 - 20 T11	3.00	3.33	3.1
0 - 24 T12	4.67	4.33	4.5
Control T13	9.00	9.67	9.3
LSD	2.2	2.13	

Table 3: Weeding Regime/Weed Infestation on yield of Turmeric in 2008 and 2009.

Treatments weeding Regime		**Rhizome Yield (t/ha) 2008**	**2009**	**Mean**	**% RY**
Weed free(Wks)					
0 - 4	T1	4.03	4.05	4.04	0.61
0 - 8	T2	4.73	12.10	8.41	1.27
0 - 12	T3	4.80	12.93	8.86	1.34
0 - 16	T4	4.00	11.33	7.70	1.17
0 - 20	T5	5.90	9.26	7.60	1.15
0 - 24	T6	5.30	14.45	9.90	1.5
Weed Infested					
0 - 4	T7	4.30	8.71	6.50	0.98
0 - 8	T8	6.17	12.33	9.50	1.41
0 -12	T9	4.90	8.00	6.40	0.97
0 - 16	T10	3.88	6.21	5.00	0.76
0 - 20	T11	3.30	4.00	3.60	0.55

0 - 24	T12	3.00	3.05	3.00	0.45
Control	T13	4.57	8.67	6.60	1.00
LSD0.05		1.02	3.06	-	-

CONCLUSION

. It is worthy to note that turmeric can tolerate weed competition for 8weeks after planting(WAP) before yield starts depressing probably due to the fact that turmeric is a mulch loving plant and weed at that point may be serving as mulch to the crop. It can be concluded that yield loss due to weed interference was determined to range between 3-55%, while critical period of weed interference is 8-12 weeks after planting(WAP) under Umudike condition. The result implied therefore that first weeding for Turmeric should be carried out at 8 weeks after planting.

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