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Effect of Tillage Operations on the Management of *Tithonia diversifolia* in Maize (*Zea mays*)

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Abstract

The influence of three tillage methods; plough and harrow, use of hoe and minimum tillage were evaluated for *Tithonia* management in a maize field. Tillage treatments employed were plough and harrow, use of hoe and minimum tillage (clearing and packing only).The experiments were laid down in Randomized Complete Block with three replicates to give 9 experimental units.The experiments were conducted at the Teaching and Research Farm, Ekiti State University, Ado-Ekiti, Nigeria (April-September, 2009 and May-August 2010). Teaching and Research Farm Federal College of Agriculture Akure, Nigeria (May-August 2010) and Agricultural Machines and Machinery Training Centre Akure, Nigeria (July-October, 2009).Data collected on growth parameters and yield of maize as well as *Tithonia* density and biomass were subjected to ANOVA and means separated by DMRT. The conventional tillage (plough and harrow) resulted in significantly (at 5% by DMRT) higher maize grain yield (3.37 t/ha), lower *Tithonia* shoot dry weight (1.37 t/ha) compared with the respective values of 2.51 t/ha and 1.91 t/ha for hoe weeding as well as 2.12 and 1.76 t/ha for minimum tillage at 5% by DMRT. The highest gross margin (GM) of ₦148.600.00 was obtained from plough and harrow treatment, similarly, the highest Marginal Rate of Returns of 2.80 was obtained from plough and harrow treatment, The relative abundance of *Tithonia* at 8 and 12 WAP was between 93.1 and 98.6 % and this indicates that the plant could be a dominant weed in a farmland.

Key words: Management, tillage, maize, gross margin.

1.0 Introduction

Weed interference is a major maize production constraint in southwestern Nigeria. Most farmers in the tropical rain forest depend on rain for farming and weed aggressiveness is associated with rain-fed agriculture. *Tithonia diversifolia* (Mexican sunflower in the family Asteraceae) is an annual weed growing aggressively along road paths and on abandoned farmlands all over Nigeria (2).It had been observed to be widely spread in Nigeria where it is found growing on abandoned/waste lands, along major roads and waterways and on cultivated farmlands (5).It is an aggressive shrub which grows densely and forms large communities. It eliminates plants (weeds and crops) by growing rapidly forming canopy cover over them; cutting off light to them and capable of causing considerable yield losses in cultivated crops. The aggressiveness of *Tithonia diversifolia* offers it the ability to outcompete most arable crops in cultivated lands (3). Tillage which is the mechanical manipulation of the soil and plant residues to prepare a seedbed for crop planting has long been an essential component of traditional agricultural systems. Tillage (plough with tractor) gave significantly higher maize cob weight, grain yield and total biomass (778.7 $kgha^{-1}$, 5880.4 $kgha^{-1}$, 2570.0$kgha^{-1}$) respectively over manual hoe (538.6 $kgha^{-1}$ 400.6 $kgha^{-1}$ and 1700 $kgha^{-1}$) in Ghana (1).

Reduced tillage based on hand-hoe had 17% ($P< 0.01$) more weed ground cover and 9% ($P< 0.05$) more weed dry matter compared with conventional tillage plots in the 2009/10 season in Zimbabwe (12)

The weed is gaining prominence as a serious weed in south-western Nigeria especially in old farms and roadsides. Most research work focused on the use of *Tithonia* for animal feed, soil improvement with very little on its management.There is need for more information on the appropriate integrated management options for *Tithonia.* This study was therefore, carried out to determine the effect of different tillage methods in controlling *Tithonia diversifolia* in southwestern Nigeria.

2.0 Materials and Methods

Field experiments were conducted at the Teaching and Research Farm of the Ekiti State University, Ado-Ekiti, in April to September 2009, May-August, 2010; Agricultural Machines and Machinery Training Centre, Akure in July to October 2009 and at the Teaching and Research Farm of the Federal College of Agriculture, Akure in May to August 2010. All the sites are in the rainforest agro-ecological zone of southwestern Nigeria. The pre-cropping physical and chemical properties of the soils are contained in (Table 1). The texture of the soils was sandy loam with pH of 5.06-6.20, percentage organic matter of 0.55-3.50 and percentage Nitrogen of 0.03-0.15. The experiment was laid out in a Randomized Complete Block Design with three replications to give 9 experimental units. Tillage treatments employed were plough and harrow, use of hoe and minimum tillage (clearing and packing only). Each plot size was 9 m^2 with 1 m space between plots. Maize SUWAN – I – SR variety was planted at a spacing of 75 x 50 cm (2 plants per hole) to give a planting density of 53,333 per hectare. Atrazine was sprayed at the rate of 2 kg a.i at planting. NPK 15-15-15 fertilizer was applied at 200 kg/ha at 2 WAP. Weed samples were collected with two 0.25 m^2 quadrat randomly placed along a diagonal transect in each plot at 4, 8 and 12 WAP (4). Counts of *Tithonia* and other weed species found in the quadrat were taken. Weed species were identified with the aid of (6). Relative weed density (RD) was determined by dividing the mean density of weed species by the total density multiplied by 100 (4). RD = MWD/TWD x 100 where RD =

Relative density, WD = Weed density and TW= Total weed density. Dry weight of *Tithonia* was determined on the oven-drying at 80^0C for 48 hours. Maize girth, height and number of leaves, ear dry weight was recorded from three randomly selected plants per individual plot at 4, 6, 8 WAP. Ear dry weight was recorded per individual plot. Grain yield was obtained per individual plot.

2.1Data Analysis

Data generated from the experiment were subjected to Analysis of Variance (ANOVA) and their means were separated using the Duncan's Multiple Range Test (DMRT) at 5% level of probability. Cost and return analysis were carried out by using gross margin (GM). The GM calculation is based on the total of all variable costs involved (Table 2) in the production and all revenue realized from a given production. Returns on investment were determined by the use of Marginal Rate of Returns (MRR). MRR is an important determinant of profitability of any given enterprises. Gross Margin (GM) was calculated using GM= GR-TVC where GR = Gross returns, TVC = Total Variable Cost MRR was calculated using the formular: MRR= GM/TVC where MRR, GM and TVC are as defined above.

Table 1: Pre-cropping soil physical and chemical properties of experimental site

Parameter	**Values**				
Ado-EkitiAkure					
	2009	**2010**	**2009**	**2010**	**Method**
pH (H_2O)	5.86	5.06	5.24	6.20	Buffer
0rganic carbon (%)	0.34	1.05	2.03	1.46	Oxidation& reduction
0rganic matter (%)	0.55	1.82	3.50	2.51	From organic carbon
Nitrogen (%)	0.03	0.08	0.13	0.15	Khedjal
P (mg/kg)	20.44	21.07	12.81	11.97	Flame photometer
K (Cmol/kg)	0.20	0.28	0.40	0.22	Flame photometer
Na (Cmol/kg	0.38	0.47	0.49	0.19	Spectrophotometer
Ca (Cmol/kg)	3.40	3.20	2.80	5.20	Spectrophotometer
Mg (Cmol/ kg)	1.30	1.40	1.20	2.70	Spectrophotometer
Sand (g/kg)	568	568	566	228	From organic carbon
Silt (g/kg)	130	120	140	300	From organic carbon
Clay (g/kg)	292	272	292	472	From organic carbon

Soil samples were collected and analysed in April and August (Experiment conducted in 2009) and in May for experiments conducted in 2010.

Table 2: Variable cost of operation and inputs in maize production

Farm operation	**Cost**
Slashing	- 35 mandays at N500/manday/ha
Packing	-10 mandays at N500/manday/ha
Planting (maize)	- 10mandays @ N400 per manday/ha
Ploughing	- 5000.00/ha
Harrowing	- 4000.00/ha
Spraying	-5 mandays/ha @ N1000/manday/ha
Planting (maize)	-10 mandays/ha @ N1000/manday/ha
Fertilizer application	-10 mandays@ N1000/manday/ha
Harvesting	-10 mandays@ N1000/manday/ha
Haulage	-N1500.00/mt
Shelling and bagging	-N2000.00/ mt
Incidentals	-N2500.00/ mt
Selling price of maize	-N60,000.00/mt
Atrazine, 2kg @ N500/kg	-N1000.00

Cost analysis average for all the experiments i.e. sites and year.

3.0 Results

3.1 Weed composition at experimental sites

Although the experiments were conducted on sites heavily infested with *Tithonia,* some other weed species were also present. At the Teaching and Research Farm of Ekiti State University, Ado-Ekiti, other weed species found included *Talinum fruticosum, Digitaria horinzontalis, Cyperus esculentus, Chromolaena odorata and Sida acuta* 2009, as well as *Chromolaena odorata, Mucuna utilis, Aspilia africana and Panicum maximum* in 2010, at the Akure experimental site, the other weed species present were *Chromolaen aodorata, Mucuna utilis, Aspilia africana and Panicum maximum* in

2009,as well as *Panicum maximum, Euphorbia heterophylla, Urena lobata, Commelina erecta subsp erecta, Asystasia gangetica, Cyperus esculentus, Chromolaena odorata* and *Sida acuta* 2010.

3.2 *Tithonia* growth and biomass

The density of *Tithonia* was significantly affected by soil tillage practice at 8 and 12 WAP in both years in Ado Ekiti and Akure at 4, 8 and 12 WAP in 2009 and 2010 and in the combined analysis (Table 3). The use of conventional tillage (plough and harrow) resulted in significantly (at 5% by DMRT) lower *Tithonia* density compared to the use of hoe and minimum tillage at 4, 8 and 12WAP in Ado Ekiti and Akurein 2009 and 2010 and at 4, 8 and 12 WAP in the combined analysis.

The effect of tillage practices was significant on *Tithonia* height in both years and at both locations as well as in combined analysis (Table 4). *Tithonia* plants were significantly (at 5% by DMRT) taller on the conventionally-tilled plots and those hoe weeded compared to minimum tillage at Ado-Ekiti in both years. Similarly, *Tithonia* plants were taller on the hoe weeded plots compared to minimum tillage at Akure in both years. Conventional tillage also resulted in significantly taller *Tithonia* plants than minimum tillage at 8 and 12 WAP at Akure and in the combined analysis.

Conventional tillage resulted in significant (at 5% by DMRT) reduction of *Tithonia* dry weight at 12 WAP in 2009 and 2010 and in the combined analysis (Table 5). Similarly, conventional tillage reduced *Tithonia* dry weight compared to hoe and minimum tillage at 12 WAP in 2009 at Ado Ekiti and lower than the use of hoe at 4 and 12 WAP in 2010 at Akure and in the combined analysis. The conventional tillage reduced *Tithonia* dry weight at 12 WAP by 27 and 20% compared with the use of hoe and minimum tillage respectively in the combined analysis.

Table 3: Effect of tillage on *Tithonia* density (nos. m^{-2}) observed at 4, 8 and 12 weeks after planting

Treatments	Ado-Ekiti						Akure						Mean		
	2009			2010			2009			2010					
	4	8	12	4	8	12	4	8	12	4	8	12	4	8	12
PH	5.3b	6.5c	3.2b	46.7b	9.1b	6.3b	8.1b	6.7c	6.2b	9.6b	7.4b	6.0c	17.4c	7.4c	5.4c
HOE	13.3a	17.6a	5.6a	71.3a	12.1a	8.0a	32.5a	10.0a	7.6a	40.8a	11.0a	7.6b	39.4a	12.6a	7.2a
MIN	6.3b	11.8b	2.9b	70.1a	11.0a	6.5ab	30.8a	7.8b	7.3a	34.7a	10.7ab	8.6a	35.4b	10.3b	6.3b
SE±	1.5	5.5	2.2	0.1	1.8	1.5	0.1	1.5	1.5	2.2	3.5	0.9	0.1	0.1	0.1

Means with the same letter in each column are not significantly different at 5% level of probability by DMRT *= Significant at 5%

Table 4: Effects of tillage on *Tithonia* height (m) observed at 4, 8 and 12 weeks after planting

Treatments	Ado-Ekiti						Akure						Mean		
	2009			2010			2009			2010					
	4	8	12	4	8	12	4	8	12	4	8	12	4	8	12
PH	0.52b	1.05b	1.77a	0.23a	0.96a	1.78a	0.18b	0.90a	1.09b	0.21b	0.95a	1.75a	0.28b	0.96b	1.59
HOE	0.69a	1.38a	1.99a	0.28a	0.85ab	1.64a	0.30a	0.84a	1.39ab	0.35a	1.15a	1.85a	0.40a	1.05a	1.71
MIN	0.54a	1.08a	1.45c	0.09c	0.35c	1.32c	0.11b	0.38b	0.79b	0.29a	0.55b	1.22c	0.25c	0.59a	1.19
SE±	0.3	0.3	0.3	0.6	0.1	0.3	0.02	0.4	0.3	0.6	0.3	0.2	0.1	0.1	NS

Means with the same letter in each column are not significantly different at 5% level of probability by DMRT *= Significant at 5% PH =plough&harrow,

Table 5: Effects of tillage on *Tithonia* shoot dry weight (mt/ha) observed at 4, 8 and 12 weeks after planting

Treatments	Ado-Ekiti						Akure						Mean		
	2009			2010			2009			2010					
	4	8	12	4	8	12	4	8	12	4	8	12	4	8	12
PH	0.04	0.50b	0.91b	0.47	1.44a	2.00b	0.01	0.10	1.10b	0.03b	0.12	1.50b	0.13b	0.54	1.37b
HOE	0.01	0.31a	1.53a	0.50	1.25ab	2.21a	0.14	0.02	1.80a	1.78a	0.06	2.10a	0.60a	0.41	1.91a
MIN	0.08	1.28a	1.44a	0.44	1.23b	2.14a	0.01	0.08	1.46a	0.05b	0.09	2.08a	0.14b	0.67	1.78a
SE±	NS	2.2	2.6	NS	0.1	0.9	NS	NS	0.32	0.4	NS	0.2	0.1	NS	NS

Means with the same letter in each column are not significantly different at 5% level of probability by DMRT *= Significant at 5%

Table 6: Effects of tillage on maize plant height (m) observed at 4, 6 and 8 weeks after planting

Treatments	Ado-Ekiti						Akure						Mean		
	2009			2010			2009			2010					
	4	6	8	4	6	8	4	6	8	4	6	8	4	6	8
PH	1.08	2.01	2.87	0.65	1.67	2.96a	0.52	1.34	2.76	0.66	1.57a	2.92	0.72	1.64a	2.87a
HOE	1.00	1.86	2.73	1.00	1.54	2.58b	0.51	1.27	2.52	0.63	1.38b	2.68	0.78	1.51b	2.62b
MIN	0.85	1.80	2.62	0.65	1.49	2.73b	0.53	1.24	2.57	0.62	1.35b	2.70	0.66	1.47b	2.65b
SE±	NS	NS	NS	NS	NS	0.1	NS	NS	NS	NS	0.1	NS	NS	0.1	0.2

Means with the same letter in each column are not significantly different at 5% level of probability by DMRT *= Significant at 5%

Table 7 Effects of tillage on maize leaves (nos) observed at 4, 6 and 8 weeks after planting

Treatments	Ado-Ekiti						Akure						Mean		
	2009			2010			2009			2010					
	4	6	8	4	6	8	4	6	8	4	6	8	4	6	8
PH	8.0	11.7	12.0	7.4	10.6	12.3	6.5	10.4	12.5a	7.1	10.5a	12.0a	7.2a	10.8a	12.2a
HOE	7.5	11.2	11.5	7.0	10.2	12.3	6.3	9.3	11.3b	7.0	9.5b	10.6c	6.9c	10.0b	11.4b
MIN	7.8	11.2	12.0	7.2	9.8	11.8	6.2	9.3	11.4b	7.0	9.2b	11.1b	7.0b	9.8b	11.5b
SE±	NS	NS	NS	NS	NS	NS	NS	NS	0.7	NS	0.8	1.0	0.2	0.1	0.2

Means with the same letter in each column are not significantly different at 5% level of probability by DMRT *= Significant at 5%

Table 8: Effects of tillage on maize girth (cm) observed at 4, 6 and 8 weeks after planting

Treatments	Ado-Ekiti						Akure						Mean		
	2009			2010			2009			2010					
	4	6	8	4	6	8	4	6	8	4	6	8	4	6	8
PH	2.0	3.1a	3.2a	2.2	3.0a	3.1a	1.9	3.2	3.2	2.1	3.0	3.1	2.0	3.1a	3.1a
HOE	2.0	2.8b	3.0b	2.2	2.7b	2.9c	1.8	2.9	2.9	2.0	2.8	2.9	2.0	2.8b	2.9b
MIN	2.0	2.8b	3.0b	2.2	2.8b	3.0b	1.9	2.8	2.9	2.0	2.8	2.9	2.0	2.8b	2.9b
SE±	NS	0.2	0.2	NS	0.2	0.2	NS	NS	NS	NS	NS	NS	NS	0.1	0.1

3.3 Maize growth

The conventional tillage resulted in significantly (at 5% by DMRT) taller maize plants than the use of hoe and minimum tillage in 2010 at 8 WAP at Ado Ekiti and 6 WAP at Akure as well as 6 and 8 WAP in the combined analysis (Table 6). The use of hoe and minimum tillage reduced maize plant height by 8.7 and 7.6% respectively relative to the conventional tillage.

Conventional tillage resulted in significantly (at 5% by DMRT) higher number of leaves per stand of maize than the use of hoe and minimum tillage at 6 and 8 WAP in 2010; 8 WAP in 2009 at Akure,6 and 8 WAP in the combined analysis (Table 7). The use of hoe and minimum tillage reduced number of leaves per maize stand by 6.5% and 5.7%respectively compared to plough and harrow treatments at 8 WAP in the combined analysis.

Conventional tillage resulted in significantly (at 5% by DMRT) bigger maize girth than the use of hoe and minimum tillage at 6 and 8 WAP in 2009 and 2010 respectively at Ado-Ekiti as well as 6 and 8 WAP in the combined analysis (Table 8).

3.4 Ear dry weight and grain yield

The plough and harrow treatment produced significantly (at 5% by DMRT) higher ear weight than hoe and minimum tillage treatment (Table 9) at 2009 in Ado-Ekiti and in the combined analysis.

Plough and harrow produced significantly (at 5% by DMRT) higher maize grain yield than the use of hoe and minimum tillage in both years at Ado E|kiti and in 2010 at Akure as well as in the combined analysis (Table 10)

The highest gross margin (GM) of₦148, 600.00 was obtained in plough and harrow treatment. The highest Marginal Rate of Returns (MRR) of 2.80 was obtained from plough and harrow plots. (Table 11).

3.5 Relative weed abundance

Tithonia diversifolia relative abundance was between 93.1 and 98.6% at the four experimental sites. Other associated weed species found to be relatively abundant at 8 and 12 WAP were *Cyperus esculentus*, *Panicum maximum*, *Digitaria horizontalis* and *Senna hirsuta* (Tables 12-15).

Table 9: Effect of tillage and herbicide application on ear dry weight (g)

Treatments	Ado-Ekiti		Akure		Mean
	2009	2010	2009	2010	
Plough&Harrow	130.9a	190.3b	172.1	171.67	166.2a
Use of HOE	44.1c	207.3a	176.8	187.67	153.9c
Minimum	85.6b	208.3a	172.0	174.50	160.1b
SE±	2.6	2.6	NS	NS	1.0

Means with the same letter in each column are not significantly different at 5% level of probability by DMRT *= Significant at 5%

Table 10: Effect of tillage and herbicide application on maize grain yield (mt/ha)

Treatments	Ado-Ekiti		Akure		Mean
	2009	2010	2009	2010	
Plough&Harrow	3.20a	4.30a	3.00	2.95a	3.36a
Use of HOE	0.77c	3.96b	3.05	2.28b	2.51b
Minimum	1.18b	2.80c	2.44	2.09b	2.12b
SE±	0.5	0.4	NS	0.9	0.2

Means with the same letter in each column are not significantly different at 5% level of probability by DMRT *= Significant at 5%

Table 11: Cost benefit analysis of maize production as affected by tillage method

	P&H	HOE	Min.Till.
Maize grain yield (t/ha)			
	3.37	2.51	2.12
	53,000.00	94,000.00	69,000.00
Total Revenue of maize (₦/ha)			
	201,600.00	150,600.00	127,200.00
Gross Margin (₦/ha)			
	148,600.00	56,600.00	58,200.00
Marginal Rate of Returns			
	2.80	0.60	0.84

P&H= Plough and harrow, Min Till = Minimum tillage

Table 12: Relative abundance of weeds associated with *Tithonia* as affected by tillage method in Ado-Ekiti at 8 WAP

Treatments	Weed species					
	Tithonia diversifolia	*Cyperu sesculentus*	*Panicum maximum*	*Digitaria horizontalis*	*Senna hirsuta*	Total
PH	7.8					
HOE	14.8				0.3	
MIN	11.4			0.3		
Total	34			0.3	0.3	34.6
%	98.2			0.9	0.9	100

PH=plough&harrow MIN=minimum tillage

Table 13: Effects of tillage method on abundance of weed species associated with *Tithonia* in Ado-Ekiti at 12 WAP

Treatments	Weed species					
	Tithonia diversifolia	*Cyperus esculentus*	*Panicum maximum*	*Digitaria horizontalis*	*Senna hirsuta*	
PH	4.7					
HOE	6.8		0.3			
MIN	4.7		0.3	0.3	0.3	
Total	16.2		0.6	0.3	0.3	17.4
%	93.1		3.4	1.7	1.7	100

PH=plough&harrow MIN=minimum tillage

Table 14: Relative abundance of weeds associated with *Tithonia* as affected by tillage method in Akure at 8 WAP

Treatments	Weed species					
	Tithonia diversifolia	*Cyperus esculentus*	*Panicum maximum*	*Digitaria horizontalis*	*Senna hirsuta*	
PH	7.0					
HOE	10.5	0.6				
MIN	9.3	1.0				
Total	26.8	1.6				28.4
%	94.4	5.6				100

PH=plough&harrow MIN=minimum

tillage

Table 15:Effects of tillage method on abundance of weed species associated with *Tithonia* in Akure at 12 WAP

Treatment	Weed species					
	Tithonia diversifolia	*Cyperus esculentus*	*Panicum maximum*	*Digitaria horizontalis*	*Senna hirsuta*	
PH	6.1					
HOE	7.6					
MIN	8	0.3				
Total	21.7	0.3				22
%	98.6	1.4				100

PH=plough&harrow MIN=minimum tillage

Conventional tillage effectively controlled weeds by burying the weed seeds. This delayed emergence of *Tithonia* because seeds on the soil surface germinated earlier than those buried during tillage operations. The results from plough and harrow treatment are similar to earlier research reports on some weeds. The effectiveness of intensive tillage to control perennial weeds in New York (8).The highest grain yield of 2.46 mt/ha in plough and harrow treatment compared to 1.62 mt/ha obtained in hoe and minimum tillage could be attributed to the fact that a smooth tilth, weed free seed bed provides a conducive environment for germination and establishment of crop, good root ramification to access growth resources from soil, unhindered growth, and competitive advantage over later-emerging weeds. The significantly higher *Tithonia* density in plots tilled with hoe was because the tillage was superficial and not deep enough to bury *Tithonia* seeds but instead exposed those between 0-5 cm to soil surface which facilitated their germination. A minimum fresh and dry weed biomass (323 and 143 g m^{-2}); maximum biological yield of 5253kg ha^{-1} was obtained with mouldboard plow relative to time cultivator, chisel plow, disc plow and time cultivator with rotavator in Pakistan(7).

Ploughing and harrowing was found to have the least cost and the highest Gross Margin and this could be attributed to the mechanization process involved. The significantly low yield and low gross margin obtained from the use of hoe for tillage could be attributed to *Tithonia*-crop competition. The use of hoe for tillage is not profitable because of high cost of production due to high cost of labour. A higher energy output of $99.2x10^3$MJ/ha (26.2%)was obtained in conventional tillage (CT) raised bed compared to zero tillage owing to weed control, maximum net returns of 30,614 was obtained with conventional tillage (raised bed) relative to 29, 674 obtained by zero tillage raised bed (11). The relative abundance obtained for *Tithonia* without artificial infestation of the experimental sites confirm the colonizing and dominating characteristics of the plant. *Tithonia diversifolia* intercropped with okra had an overall advantage and greater biomass which leads to reduced performance of okra and therefore should be controlled so as to ensure high yield of the crop (9). *Tithonia* is able dominate a new environment because of its high prolificity, adaptability, ability to survive many adverse conditions, aggressiveness, persistence as well as seed longevity and dispersability in time (dormancy) and space (transport) (10).

4.0 CONCLUSION

Conventional tillage plot was a more effective weed control measure in a *Tithonia* dominated field. This measure resulted in the least *Tithonia* biomass, highest maize grain yield, Gross Margin and Marginal Rate of Returns. The relative abundance of *Tithonia* at 8-12 WAP indicates the dominating nature of the plant in farmlands.

COMPETING INTERESTS

Authors have declared that no competinginterests exist.

CONSENT

Authors may use the following wordings for this section: "All authors declare that ‘written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal."

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