

## Evaluation of two contrasting cassava canopy structures on weed flora composition in a rainforest zone of Nigeria.

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### Abstract

The impact of weed competition on crop growth is a universal concern to farmers. This study was conducted in 2010 at the Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife to evaluate the impact of cassava canopy on weed diversity and identify shade-tolerant weed species in response to varying canopy structure at Obafemi Awolowo University Teaching and Research Farm, Ile-Ife ecological zone. The treatments consist of hand-weeded, herbicidal treatment, and unweeded checks in the main plot. The sub-plots constituted the cassava cultivars (TMS 30572 and TME 1) laid out in a randomized complete block with a split-plot arrangement in three replications. Fifteen weed species survived under the shade of TMS 30572 where two families were monocots while four families were dicots. However, twenty weed species were recorded where TME 1 was cultivated of which two families were monocots while five families were dicots. TMS 30572 suppressed weeds by 20% when compared to TME 1. In conclusion, TME 30572 is recommended for cultivation in this agroecology to obtain a maximum benefit on cassava production.

**Keywords:** Weed, TMS 30572, TME 1, Shade-tolerant, and Weed diversity.

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### 1. Introduction

The canopy of crops suppresses weeds. The empirical information on the extent to which weeds are controlled under the shade of different crop architectures is essential. Several studies have revealed the effect of crop canopy cover on weed growth. For example, Hock *et al.*, (2006) reported a decrease in weed density by 52% under soybean canopy closure. Another study showed that spring wheat and canola canopies without herbicide application reduced weed biomass (Szumigalski and Acker, 2005).

A fully formed cassava canopy controls weed when cultivated at optimum density (Onwueme and Sinha, 1991; Dahniya and Jalloh, 1998). The common weeds found in cassava are grasses (*Imperata cylindrica*, *Panicum maximum*), sedges (*Mariscus alternifolius*, *Cyperus rotundus*), and broadleaf weeds (*Chromolaena odorata*, *Ageratum conyzoides*) (Melifonwu *et al.*, 2000). These weeds are controlled by various methods such as mechanical, cultural, and chemical measures. Unfortunately, the contribution of crop competition to weed control is often ignored despite the effectiveness of those control methods (Ross and Lembi, 1985). Hence, knowledge on all competitive weed species, the level of weed control, and the specific influence of these cassava varieties on weed species dynamics under varying cassava canopy structures (without chemical application) are therefore desirable to fully take advantage of the canopy potential. Furthermore, a vivid knowledge of the existence of various weed flora under the shade of different crops is essential to ensure the use of appropriate herbicide(s) and formulate other appropriate management strategies (Sit *et al.*, 2007). The objectives of this study are (i) to determine the influence of cassava canopy on weed flora composition and (ii) to identify shade-tolerant weed species in response to varying canopy structures at Obafemi Awolowo University Teaching and Research Farm, Ile-Ife ecological zone.

### 2. Materials and Methods

The study was at the Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife, Nigeria located at Lat. 07°28'N and Long. 04°33'E with a mean altitude of 244 m above sea level. Ile-Ife lies in the transitional zone between the humid and sub-humid tropical climates and receives about 955.8 mm annual rainfall with maximum rainfall between June (181.3 mm) and October (166.6 mm). The mean minimum and maximum temperature vary between 21.2 and 27.8°C. The study sites were at different locations with pH of 4.1 and 3.9 for locations 1 and 2.

The study designed was a randomized complete block with a split-plot arrangement laid in three replications. The weed control treatments (hand-weeded, herbicidal treatment, and unweeded check) constituted the main plot while cassava cultivars (TMS 30572 and TME 1) were the sub-plots. The cassava cultivars planted at 1 m × 1 m have 12 rows per sub-plot with 288 plant density and 576 per plot which amounted to 5,184 per location. The weed floras collected were from the fallow vegetation before land preparation and during the study. Quadrat of 1 m × 1 m was randomly thrown before land preparation, two times at 5 m intervals along transects that were 5 m apart, given a total of 40 samples for each location. Weed species found within each quadrat were harvested and identified using Akobundu and Agyakwa, (1987). Weed density was determined by counting the harvested weed stands at monthly intervals.

The data collected on cassava and weed samples were analyzed using the Statistical Analysis System (SAS) statistical package version 8.2 (SAS Institute, 1999) to determine the analysis of variance to analyze main plot effect, sub-plot effect, and interaction between the main plot and sub-plot effects. The significant effect mean values were compared using the Least Significant Difference (LSD) and the Duncan Multiple Range Test (DMRT) at a 5% level of probability, where appropriate. Shannon-Wiener index ( $H'$ ) was worked out using the formula described by Ogbeibu (2005):

$$H' = N \log N - \sum f_i \log f_i \quad \frac{\quad}{N}$$

where  $N$  is the total number of abundance per location,  $f_i$  is the abundance of individual species.

### 3. Results and Discussion

#### 3.1 Fallow weed species

The fallow weed species at the experimental locations are in Table 1. The most common weed species found on the two sites were broadleaved weeds (64%) while the percentage of sedges and grasses was 18 (Table 1). The weed species families recorded in Location 1 were ten of which monocotyledons (Commelinaceae, Cyperaceae, and Poaceae) were 30% of the entire flora while dicotyledons (Amaranthaceae, Asteraceae, Euphorbiaceae, Fabaceae, Lamiaceae, Malvaceae, and Rubiaceae) represented 70% (Table 2). Twenty-two weed species were observed and the species with the highest frequency of occurrence were *Ageratum conyzoides* Linn., *Oldenlandia corymbosa* Linn., *Panicum maximum* Jacq., and *Sida acuta* Burm (Table 3). The nine annual weed species observed in location 1 are 41% while 11 perennial weed species recorded represented 59% (Table 1).

In location 2, the families of the weed species observed were 9 of which 2 were monocotyledons (Cyperaceae, Poaceae) while 7 were dicotyledons (Asteraceae, Convolvulaceae, Euphorbiaceae, Fabaceae, Loganiaceae, Malvaceae, Verbenaceae) (Table 2). The monocotyledons were 22% of the entire flora while dicotyledons represented 78%. Eighteen weed species were recorded and those with the highest frequency were *Alternanthera pungens* H. B. & K., *A. conyzoides*, *Aspilia africana* (Pers.) C. D. Adams, *Calopogonium mucunoides* Desv., *P. maximum*, and *S. acuta*. Six annual weed species were recorded which constituted 33% of the total weed flora while twelve perennial weeds (67%) were recorded (Table 1).

Monocotyledons have high shade sensitivity than dicotyledons (Shetty *et al.*, 1982). Some weeds acclimatize to low growth irradiance through a plastic response that reduces the growth-limiting effects of shading and allows restoration of light rates of photosynthesis when the plant is exposed to high irradiance (Zimdahl, 2007). A vigorous competition from shade-tolerant weeds for growth factors occurred because of their ability to grow under low light intensity. The shade-tolerant weeds recorded in the fallow vegetation in both locations are *A. conyzoides*, *A. africana*, *B. deflexa*, *C. odorata*, *C. dactylon*, *I. triloba*, and *P. maximum* (Bodgan, 1977; Chen and Hutton, 1992; Browmilow, 2001; Chen and Aminah, 1992; Holm *et al.*, 1977; Parsons and Cuthbertson, 1992). *C. odorata* is an aggressive shrub that competes with crop yield because of its rapid spread, quick germination, and straggling canopy formation. It has been reported to grow even in forest environments that are too shaded for seed production (Koutika and Rainey, 2010; Riddock *et al.*, 1991).

Weed species and their heights that compete for nutrients, space, and water but not for light because TMS 30572 (200 cm) and TME 1 (300 cm) are much taller in the fallow weed flora in both locations were *A. pungens* (50 – 60 cm), *A. conyzoides* (70 cm), *B. deflexa* (45 cm), *C. benghalensis* (60 cm), *C. esculentus* (60 cm), *C. rotundus* (50 cm), *M. alternifolius* (60 cm), *E. heterophylla* (90 cm), *P. amarus* (70 cm), *P. africanum* (60 cm), *P. scrobiculatum* (60 cm), *C. dactylon* (20 cm), *O. corymbosa* (30 cm), *S. acuta* (100 cm), *S. anthelmia* (60 cm) and *S. indica* (60 – 90 cm) (Akobundu and Agyakwa, 1987). The weeds in the fallow weed flora and their heights that would compete for light, nutrient, space, and water with TMS 30572 and TME 1 in both locations, because they grow tall are *A.*

*africana* (150 cm), *C. odorata* (300 cm), *P. maximum* (250 – 400 cm) and *T. diversifolia* (250 cm) (Akobundu and Agyakwa, 1987). The twining or trailing weed species in the fallow weed flora in both locations that could compete for light, nutrients, space, and water with TMS 30572 and TME 1 are *C. mucunoides* and *I. triloba*.

### 3.2 Influence of crop canopy architecture on weeds

The weed species observed in plots where TMS 30572 and TME 1 were planted are shown in Table 3. In the unweeded plots of TMS 30572 in Location 1, the weed families observed were five of which two were monocotyledons (Cyperaceae, Poaceae) while three were dicotyledons (Asteraceae, Fabaceae, Malvaceae) (Table

Family	Weed species	Frequency (%)		Growth habit
		Location 1	Location 2	
Amaranthaceae	<i>Alternanthera pungens</i> H. B. & K.	38	100	PBL
Asteraceae	<i>Ageratum conyzoides</i> Linn.	100	100	ABL
	<i>Aspilia africana</i> (Pers.) C. D. Adams	94	100	PBL
	<i>Chromolaena odorata</i> (L.) R. M. King & Robinson	94	88	PBL
	<i>Tithonia diversifolia</i> (Hemsl.) A. Gray	51	38	PBL
	<i>Commelina benghalensis</i> L.	38	63	PS
Commelinaceae	<i>Commelina benghalensis</i> L.	38	63	PS
Convolvulaceae	<i>Ipomoea triloba</i> Linn.	38	-	ABL
Cyperaceae	<i>Cyperus esculentus</i> Linn.	38	38	PS
	<i>Cyperus rotundus</i> Linn.	63	63	PS
	<i>Mariscus alternifolius</i> Vahl.	63	63	PS
Euphorbiaceae	<i>Euphorbia heterophylla</i> Linn.	57	38	ABL
	<i>Phyllanthus amarus</i> Schum. & Thonn.	63	-	ABL
Fabaceae	<i>Calopogonium mucunoides</i> Desv.	94	100	ABL
Lamiaceae	<i>Platostoma africanum</i> P. Beauv.	70	-	ABL
Loganiaceae	<i>Spigelia anthelmia</i> Linn.	63	63	ABL
Malvaceae	<i>Sida acuta</i> Burm.	100	100	PBL
Poaceae	<i>Brachiaria deflexa</i> (Schumach.) C. E. Hubbard ex. Robyns	70	63	AG
	<i>Panicum maximum</i> Jacq.	100	100	PG
	<i>Paspalum scrobiculatum</i> Linn.	57	70	PG
	<i>Cynodon dactylon</i> (Linn.) Pers.	38	-	PG
	<i>Oldenlandia corymbosa</i> Linn.	100	75	ABL
Verbenaceae	<i>Starchytarpheta indica</i> (Linn.) Vahl.	75	75	PBL

2). Eight weed species with highest frequency of occurrence are *C. mucunoides* and *P. maximum* (Table 3). The maximum weed density observed was for *P. scrobiculatum* (11.30) while the minimum value recorded was for *A. africana*, *C. odorata*, and *T. diversifolia* (2.10).

Table 1. Fallow weed species at the experimental locations, Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife, Nigeria.

ABL = Annual Broadleaf, PBL = Perennial Broadleaf, PS = Perennial Sedge, AG = Annual Grass, PG = Perennial Grass

Table 2. Weed species family as influenced by different cassava canopy structures at two different locations at the Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife, Nigeria.

Fourteen weed species were recorded in the fallow vegetation but absent where TMS 30572 was planted (Table 3). The two weed species absent where TMS 30572 was planted but grew where TME 1 was cultivated, were *C. rotundus*, and *S. indica* (Table 3).

Where TME 1 was grown in the unweeded plots in Location 1, the weed families observed were six, out of which two were monocotyledons (Cyperaceae, Poaceae) while four were dicotyledons (Asteraceae, Fabaceae, Malvaceae, Rubiaceae). Of all the ten weed species recorded, nine weed species with the highest frequency of occurrence are

Family	Location 1			Location 2		
	Fallow	TMS 30572	TME 1	Fallow	TMS 30572	TME 1
<b>Monocotyledons</b>	<b>7</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>2</b>	<b>4</b>
Commelinaceae	1	0	0	0	0	0
Cyperaceae	2	1	2	3	1	2
Poaceae	4	2	2	2	1	2
<b>Dicotyledons</b>	<b>11</b>	<b>5</b>	<b>6</b>	<b>10</b>	<b>5</b>	<b>6</b>
Amaranthaceae	1	0	0	0	0	0
Asteraceae	4	3	3	4	3	2
Euphorbiaceae	2	0	0	1	0	0
Fabaceae	1	1	1	1	1	1
Lamiaceae	1	0	0	0	0	0
Malvaceae	1	1	1	1	1	1
Rubiaceae	1	0	1	0	0	1
Verbenaceae	0	0	0	1	0	1
Convolvulaceae	0	0	0	1	0	0
Loganiaceae	0	0	0	1	0	0
<b>Total</b>	<b>18</b>	<b>8</b>	<b>10</b>	<b>15</b>	<b>7</b>	<b>10</b>

*A. africana*, *C. mucunoides*, *C. odorata*, *C. rotundus*, *M. alternifolius*, *P. maximum*, *S. acuta* and *T. diversifolia* (Table 3). Weed species with maximum density was *P. scrobiculatum* (13.7) while *C. rotundus* and *Panicum maximum* (3.30) showed minimum density. Twelve weed species were recorded in the fallow vegetation but absent where TME 1 was planted (Table 3).

In Location 2, where TMS 30572 was grown (unweeded plots), the weed families observed were five, out of which two were monocotyledons (Cyperaceae, Poaceae) while three were dicotyledons (Asteraceae, Fabaceae, Malvaceae). Seven weed species with the highest frequency of occurrence were *C. mucunoides* and *P. maximum*. Fifteen weed species were present in the fallow vegetation but not in unweeded plots of TMS 30572 (Table 3). The three weed species absent in plots of TMS 30572 but that grew under the shade of TME 1 were *C. rotundus*, *P. scrobiculatum*, and *S. indica* (Table 3). In unweeded plots of TME 1 (Location 2), the weed families observed were seven, out of which two were monocotyledons (Cyperaceae, Poaceae) while five were dicotyledons (Asteraceae, Fabaceae, Malvaceae, Rubiaceae, Verbenaceae) (Table 2). Ten weed species recorded had a maximum frequency of occurrence (Table 3). The weed species found in the fallow vegetation but were absent where TME 1 was grown in unweeded plots were twelve. The weed species found in unweeded plots of TME 1 but absent in unweeded plots of TMS 30572 were *C. haspan*, *C. rotundus*, *P. scrobiculatum*, and *S. indica* (Table 3).

In Location 1, Shannon's index of weed flora diversity for TMS 30572 and TME 1 was 1.85 and 2.17 respectively. However, it was high in fallow land (2.76) (Table 3). The weed flora diversity was significantly higher in the plot where TME 1 was planted when compared to TMS 30572. A similar trend of weed flora diversity occurred in Location 2 where TMS 30572 (1.35) and TME 1 (1.80) were cultivated (Table 3). The weed species limited in distribution (Shannon's index = 0) among the twenty-two plants recorded was seven. However, the ten weed species (*A. africana*, *C. mucunoides*, *C. odorata*, *C. rotundus*, *M. alternifolius*, *P. maximum*, *P. scrobiculatum*, *S. acuta*, *S. indica* and *T. diversifolia*) recorded under the canopies of TMS 30572 and TME 1 need special attention.

Table 3. Density, frequency and Shannon-Wiener index of diversity of weed species under TMS 30572 and TME 1 canopies at two locations at the Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife, Nigeria.

Weed Species	Location 1			Location 2			H'
	Fallow	TMS 30572	TME 1	Fallow	TMS 30572	TME 1	

	D	F	D	F	D	F	D	F	D	F	D	F	
<i>Ageratum conyzoides</i> Linn.	22.05	100					61.73	100					<b>0.69</b>
<i>Alternanthera pungens</i> H. B. & K.	6.71	38					19.10	100					<b>0.78</b>
<i>Aspilia africana</i> (Pers.) C. D. Adams	5.81	94	2.10	67	4.70	100	7.80	100	4.00	67	7.70	100	<b>1.96</b>
<i>Brachiaria deflexa</i> (Schumach.) C. E. Hubbard ex. Robyns	2.01	70					1.46	63					<b>1.27</b>
<i>Calopogonium mucunoides</i> Desv.	11.97	94	6.00	100	6.00	100	11.28	100	6.70	100	7.70	100	<b>1.60</b>
<i>Chromolaena odorata</i> (L.) R. M. King & Robinson	6.35	94	2.10	67	4.70	100	6.25	88	1.40	67	6.00	100	<b>1.78</b>
<i>Commelina benghalensis</i> L.	1.35	38					2.16	63					<b>1.20</b>
<i>Cynodon dactylon</i> (Linn.) Pers.	6.49	38											<b>0.21</b>
<i>Cyperus haspan</i> Linn.	0.77	38					0.77	38					<b>1.33</b>
<i>Cyperus rotundus</i> Linn.	3.51	63			3.30	100	3.89	63			0.90	100	<b>1.64</b>
<i>Euphorbia heterophylla</i> Linn.	3.79	57					2.03	38					<b>1.06</b>
<i>Ipomoea triloba</i> Linn.	1.25	38											<b>0.54</b>
<i>Mariscus alternifolius</i> Vahl.	3.69	63	2.80	67	4.10	100	8.54	63	6.00	67	7.20	100	<b>1.83</b>
<i>Oldenlandia corymbosa</i> Linn.	24.1	100					15.58	75					<b>0.72</b>
<i>Panicum maximum</i> Jacq.	5.65	100	3.30	100	3.30	100	5.95	100	4.00	100	4.70	100	<b>1.96</b>
<i>Paspalum scrobiculatum</i> Linn.	7.54	57	11.30	33	13.70	67	7.54	70			23.30	100	<b>1.77</b>
<i>Phyllanthus amarus</i> Schum. & Thonn.	3.35	63											<b>0.44</b>
<i>Platostoma africanum</i> P. Beauv.	3.92	70											<b>0.42</b>
<i>Sida acuta</i> Burm.	6.20	100	2.20	67	4.10	100	6.33	100	2.80	67	9.00	100	<b>1.87</b>
<i>Spigelia anthelmia</i> Linn.	3.63	63					2.02	63					<b>1.13</b>
<i>Starchytarpheta indica</i> (Linn.) Vahl.	8.40	75			6.00	100	10.84	75			5.30	100	<b>1.28</b>
<i>Tithonia diversifolia</i> (Hemsl.) A. Gray	4.54	51	2.10	67	11.70	100	0.82	38	2.00	67	6.00	100	<b>1.99</b>
<b>H'</b>	<b>2.76</b>		<b>1.85</b>		<b>2.17</b>		<b>2.29</b>		<b>1.35</b>		<b>1.80</b>		

Dicot weeds were dominant in TMS 30572 and TME 1 plots in both Locations; however, their populations were higher in fallow vegetation than in plots of TMS 30572 and TME 1. The luxuriant dicot weed growth in the latter plots could be due to the high annual rainfall and fertile loamy soil. The low density of monocot weeds in cropped land indicated low adaptability to cropping and cultivation. The reports of Sit *et al.* (2007) on weed morphological distribution in fallow and cropped land validated this result. The monocot and dicot weed flora observed in plots of TMS 30572 were lower than in those of TME 1 in both Locations. The monocot and dicot weed flora observed in plots of TMS 30572 were lower than in those of TME 1 in both Locations. However, the reduction in dicot weeds was not as high as monocot weeds due to low light intensity (shading) under the canopy of TMS 30572. Shetty *et al.* (1982) reported that dicotyledons are less shade-sensitive than monocotyledons.

The variation in the observed number of weed species in the unweeded plots of TMS 30572 and TME 1 in both Locations showed that the growth of different weed species depends on the canopy spread of the cassava cultivars. For instance, the absence of *C. rotundus* and *S. indica* in TMS 30572 plot in both locations may largely be attributed to the broader canopy of TMS 30572 and a greater light interception which inhibited the emergence of these two weeds. The limited light supply reduced the photosynthesis of shaded plants, leading to poor growth, a smaller root system, and reduced capacity for water or mineral uptake. Light intensity, quality, and duration affect weed presence and survival (Zimdahl, 2007). *C. rotundus* is a shade-intolerant species (Carsky *et al.*, 1998). Zimdahl (2007) reported that shading reduced *C. rotundus* tuber production by 89%. *C. rotundus* and *S. indica* could not compete with TMS 30572 for light due to their short height (Akobundu and Agyakwa, 1987). However, *M. alternifolius* and *P. scrobiculatum* with lower heights still survived under TMS 30572 with lower density and frequency of occurrence than under TME 1. Similar height effects were observed in studies of competition between velvetleaf (*Abutilon theophrasti*) and soybean. Greater light interception by velvetleaf was due to greater height (Akey *et al.*, 1990). McGiffen *et al.* (1992) recorded a reduction in tomato yield under competition with black nightshade (*Solanum nigrum* L.) which is taller.



Plant architecture such as height, location of branches, and leaf area determine competition for light and crop yield (McGiffen *et al.*, 1992; Holt, 1995). The high frequency of *C. mucunoides* in TMS 30572 plot was due to its twining traits which enabled it to climb and inter-twine the crop canopies. Zimdahl, (2007) reported that weeds with great competitive ability gain competitive ability by twining on larger plants. They may be shade-tolerant species and their highest carbon dioxide assimilation rate may not be in full sunlight. *P. maximum* had the highest frequency of occurrence under TMS 30572 in both locations. Its shade tolerance characteristics and tall height enabled it to compete with TMS 30572 for light, water, nutrient, and space. *P. maximum* has been described as a moderately tall (250 – 400 cm) perennial grass that is difficult to control due to its ability to reproduce from seeds and vegetative propagation from basal root-stock (Obadoni and Remison, 2004; Akobundu and Agyakwa, 1987). Young *et al.* (1983) reported that quackgrass competed with soybeans for light because quackgrass was nearly the same height or taller than soybeans. The weed species present in the fallow vegetation but absent in unweeded plots of TMS 30572 in both locations was due to the canopy architecture which reduced the light supply. This showed that the growth of these weeds required full sunlight. The poor weed suppression by TME 1 in the unweeded plots in Locations 1 and 2 was due to competition from weeds and the thin crop canopy architecture. Raji *et al.* (2007) reported that TME 1 is an erect cultivar with a narrow canopy. The absence of *P. scrobiculatum* in plots of TMS 30572 in Location 2 could be ascribed to the canopy spread of this cassava cultivar which inhibited weed emergence due to limited light supply. The reduction in weed emergence was caused by low light (Hartmann and Nezadal, 1990; Ascard, 1994; Riemens *et al.*, 2007).

Most of the weeds present in the fallow vegetation in Location 2 but absent in unweeded plots of TMS 30572 and TME 1 are annual weeds. This shows that full sunlight is required for the growth of these weeds. Seeds of many annual weed species require a light stimulus to trigger their germination (Bartely and Frankland, 1982). *A. conyzoides* and *P. amarus* are weeds that are comparatively easy to control (Akobundu, 1987). Perennial weeds such as *A. pungens*, *C. benghalensis*, *C. esculentus*, *C. rotundus*, and *C. dactylon* were found in fallow vegetation in Locations 1 and 2 but were absent in plots of TMS 30572 and TME 1. This could be due to their low frequency of occurrence arising from the adverse effects of harrowing and ridging during land preparation. Harrowing and ridging uproot and kill small-seeded weeds (Anon, 1991; Sullivan, 2003). Norris (2005) reported that tillage practices employed can affect weed populations. Tillage controls weeds by burying them, separating shoots from roots, desiccating shoots, and exhausting carbohydrate reserves of perennial weeds (Zimdahl, 2007).

The absence of annual weeds in plots of TMS 30572 and TME 1 could be due to low precipitation which commenced in November, according to rainfall data at the experimental locations. Annual weeds die off during the dry season (Akobundu, 1987) because water is probably the most critical of all plants' growth requirements (King, 1966). The broader canopy diameter observed in TMS 30572 compared to TME 1 was due to varietal characteristics. Research results have shown the canopy diameter of TMS 30572 to be broader than TME 1 (Raji *et al.*, 2007) and this has been found to influence the weed species under their canopies.

## 5. Conclusion

The results from the foregoing revealed that in the unweeded plot, TMS 30572 suppressed weed species by 20% when compared to TME 1. However, in Location 1, TMS 30572 and TME 1 reduced weed flora species composition by 66% and 55% respectively. In Location 2, TMS 30572 lowered weed flora composition by 53.3% in the unweeded plots while TME 1 reduced weed flora composition by 33.3%.

Dicotyledons were dominant over monocotyledons while perennials were dominant over annual weeds in all the treated plots. The number and type of weeds varied under the cassava cultivars and weed control methods in both locations. The canopy diameter of TMS 30572 in unweeded plots in Location 1 was broader than that of TME 1 by 45.4%. The weed species observed under the shade of TMS 30572 were *A. africana*, *C. mucunoides*, *C. odorata*, *M. alternifolius*, *P. maximum*, *P. scrobiculatum*, *S. acuta*, and *T. diversifolia* while those recorded under TME 1 were *A. africana*, *C. mucunoides*, *C. odorata*, *C. rotundus*, *M. alternifolius*, *P. maximum*, *P. scrobiculatum*, *S. acuta*, *S. indica*, and *T. diversifolia*.

In Location 2, TMS 30572 canopy diameter was broader than TME 1 in unweeded plots by 42.4%. The weed species recorded under the canopies of TMS 30572 and TME 1 were similar to Location 1.

High density and frequency of weeds were observed in TME 1 in both locations because of its narrow canopy architecture. *P. maximum* was present in all plots irrespective of the weed control treatments because of its competitive ability as a perennial weed and taller growth habit than both TMS 30572 and TME 1. It also has a shade tolerance ability. *P. maximum* therefore requires special weed control attention. The use of Integrated Weed

Management (IWM) is therefore recommended for TMS 30572 and TME 1 production, particularly for the latter cultivar, in the forest agroecology of Ile-Ife.

TMS 30572 has a broader canopy architecture than TME 1, and this gave TMS 30572 a better weed-suppressing ability. This broader canopy architecture also enabled TMS 30572 to intercept maximum solar radiation for greater assimilate supply to the storage roots and higher fresh root yield than TME 1, even when weeds grow with the crop throughout the season. The preferred cultivation of TMS 30572 is recommended for maximum benefits on cassava production in this agroecology.

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