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Germination of *Mimosa diplotricha* C. Wright and its critical period of interference with maize *(Zea mays L.)* in Ibadan, Nigeria

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ABSTRACT

Maize is an important food crop but its production is constrained by interference of invasive weeds such as *Mimosa diplotricha.* The germination and Critical Period of Interference (CPI) of *Mimosa diplotricha* on maize performance were investigated in Ibadan. Twenty seeds of *Mimosa diplotricha* per Petri dish were scarified with absolute H_2SO_4 acid to assess seed germination (%). Maize variety DTMA-Y-STR was grown with seeds of *Mimosa diplotricha* in pots for 0, 2, 4, 6 and 8 weeks and subsequently weedfree till harvest (wd-n-wf). In another set of treatments, maize was grown without *Mimosa diplotricha* for the above durations before its introduction till harvest (wf-n-wd), using a completely randomised design (r=3). Weedfree (wd-0-wf) and weedy (wf-0-wd) were controls. At maturity, Plant Height (PH-cm), Stem Diameter (SD-mm) and Grain Yield (GY-g/pot) were measured, and CPI was determined by plotting duration against yield of each treatment as percentage of weedfree. Data were analysed using descriptive statistics and ANOVA at $\alpha_{0.05}$. Seeds of *Mimosa diplotricha* tolerated acid, with percentage germination ranging from 73.2% (10 minutes) to 100% (90 minutes). The *Mimosa diplotricha* in wf-0-wd plot reduced grain yield by 52%. Weedfree maize had significantly higher PH (163.1±3.4), SD (1.39±0.2) and GY (23.4±0.8) than other treatments. Graphically, 90% maize GY was obtained at wd-3-wf and wf-6-wd, indicating that the CPI of *Mimosa diplotricha* with maize was between 3 and 6 weeks after sowing. *Mimosa diplotricha*, therefore should be controlled in maize field between 3-6 weeks after sowing.

Keywords: Maize, *Mimosa diplotricha*, Weed interference, Germination.

INTRODUCTION

A major challenge in Africa for the increasing human population is that of producing adequate food to cater for them (Mapfumo, *et al*., 2005). Crop yield is affected by many factors which include the crop's genetic constituents, prevailing environmental factors, pests and diseases amongst others. Weeds are the most under estimated pests in tropical agriculture (Akobundu, 1987). Weeds often have growth advantage over crops. Therefore, they compete with crops for nutrients, water and light to the detriment of the crops being grown. Weeds are often fast growing and more efficient in utilizing nutrients than crop plants and therefore have distinct competitive advantage (Host, *et al.*, 2007). Majority of losses in agriculture are attributed to exotic weeds, which are usually invasive plant species (Pimentel *et al*., 2005).*Mimosa diplotricha* is an invasive weed that belongs to the family Fabaceae. It is a strong branched shrub with stems branching up to 6 m long. It has trailing stems often forming a tangled mass. The stems are angled, slender, greenish and covered with stiff recurved prickles. The seeds are flat and its production ranges from

8,000-12,000 per meter square. Members of *Mimosa* have seeds that exhibit seeds coat dormancy, which is a type of exogenous or physical dormancy (Galindez, *et al.*, 2016). Dormancy is the inability of intact viable seeds to complete germination under favourable condition (Das, 2011). Dormancy helps to protect the seeds from inconsistent weather conditions and also makes the seeds available in the soil seed bank.

It is estimated that weeds in general cause yield loss of about 10% in less developed countries and 25% in least developed countries (Boy and Witt, 2013). Weed interference in maize can lead to 25%-80% reduction in crop yield (Chikoye and Ekeleme, 2003), in okra weeds can cause 92% fresh fruit reduction (Awodoyin and Olubode, 2011). Fuksa *et al*. (2004) reported that weed infestation decreased plant height in classical hybrid of maize by 0.26 m. In Nigeria weed related yield losses ranging between 65% - 92% have been recorded (IITA, 2009).The critical period of weed interference is the period in the life cycle of a plant when it should be free of weeds in other to prevent yield loss (Zimdahl, 2004).Weed interference can be as a result of the weed density, length or time of interference, the type of weed, type of crop and the period in the life cycle of the crop (Ogunyemi,*et al.*2001).

Determining the critical interference stage of a weed is essential to implement weed removal at the right time so as to prevent yield loss. Therefore the objectives of this study were to monitor the germination of *Mimosa diplotricha* seeds and determine its critical period of interference in maize.

MATERIALS AND METHODS

Scarification of *M. diplotricha* seeds using acid treatment and boiling water

Scarification of seeds of *M. diplotricha* was done using 98% of 1M concentrated tetraoxosulphate (vi) acid (H_2SO_4). Twenty seeds of *M. diplotricha* per treatment (in three replicates) were soaked in the acid for 0, 5, 10, 15, 30 and 60 minutes in the first trial and then extended to 90 and 120 minutes in the second trial, after which they were rinsed in running water for five minutes. For the boiling water treatment, twenty seeds of *M. diplotricha* per treatment were wrapped in muslin cloth and steeped in boiling water (100 ^{o}C) in a beaker on an electric heater for 0, 10, 15, 30, 45and 60 seconds. Three (replicated) packs of each treatment was removed at each test time and dropped in a bowl of cold water to cool the seeds. Twenty randomly selected acid-treated and boiling water treated seeds per treatment were placed in Petri dishes (covered and labeled according to treatments) lined with Whatman No. 1 filter paper (9 cm diameter) that was adequately moistened with distilled water. The Petri dishes were arranged in a completely randomized design (CRD) on a laboratory bench in the Ecology Research Laboratory of the Department of crop Protection and Environmental Biology, University of Ibadan where they received alternating exposure to 12 hrs light and darkness. The Petri dishes were monitored for germination daily for seven days. Emergence of radicle was used as evidence of germination. Number of germinated seeds were counted and recorded.

From the data generated from the germination studies using acid and boiling water treatments, percentage seeds germinated was calculated as:

$$\% \text{ Germination} = \frac{\text{Number of germinated seeds}}{\text{Total number of seeds}} \times \frac{100}{1}$$

The germinated seed percentages were analysed using analysis of variance (ANOVA) (Gomez and Gomez, 1984) and means were separated using Fisher's least significant differences (LSD) at 5% level of significance.

The Critical Period of Interference of *M. Diplotricha* with Maize

The study was carried out in the Screen house at the Crop Garden of the Department of Crop Protection and Environmental Biology, University of Ibadan in May 2013 and June 2014. Soil samples were collected and the physical and chemical properties of the soil were determined. Interference study was conducted using the optimum density of *M. diplotriha* informed from the optimum density (45 plants / m^2) of *M. diplotricha* at a near uniform cover in its natural habitat (Tanimola,*et.al*., 2017). Maize variety Drought tolerant yellow striga resistant (DTMA-Y-STR), obtained from International Institute of Tropical Agriculture (IITA) was grown with seeds of *Mimosa diplotricha* (obtained from the roadside) in pots. The critical period of interference was in two sets of treatments {i.e. weed-free and later weedy; (wf-wd), and weedy and later weedfree; (wd-wf) conditions}. In the first set, maize crops were kept weedfree for the first 2, 4, 6 and 8 weeks after sowing (WAS) and subsequently infested with *M.diplotricha* (weedy) till harvest to determine when emerging stands of *M.diplotricha* will no longer reduce crop performance. In the second set, *M. diplotricha* was allowed to interact with maize for 2, 4, 6, and 8 weeks and subsequently kept weedfree till harvest to determine when weeds that emerged with the crop begin to suppress the growth of the crop and reduce its yield. Season long weed-free (wd-0-wf) and weedy (wf-0-wd) treatments served as checks to compare other treatments and assess the crop yield due to uncontrolled associated weed.

Weed free condition was achieved by weekly hand weeding the plot (Awodoyin and Ogunyemi, 2005) starting from one week after planting. Weeds other than *M. diplotricha* growing with crop were rogued weekly to ensure a virtually pure maize-*M. diplotricha* interaction. The experiment was laid out in completely randomized design with treatment replicated three times. At 8 WAS, the maize plant was assessed for stem length using metre rule, leaf area by measuring the length and width of the leaf and multiply by the correction factor of the leaf i.e. length x width x 0.7 for maize (Elings, 2000), stem diameter using vernier caliper. The cob was collected at maturity and total seeds weight was taken using Mettler Top loading balance. The experiment was done in two trials. The yield obtained in each treatment was compared to the yield obtained in the weed-free check (wd-0-wf) to obtain the yield as percentage of yield on weedfree plot. These were plotted against duration of interference to establish the critical period, which is the period in between the two components when the yield reduction is at most 10%. The yield each treatment as percentage of weedfree was calculated as yield on plot/ yield on weedfree X 100% The yield reduction caused by each treatment was calculated as {[(yield on weedfree plot-yield on treatment) / yield on weedfree] x 100} % (Awodoyin and Olubode, 2011) The mean reduction in two years was calculated as the average of the yield reduction of the two trails. The treatments for the study are as listed below

Treatment combinations for *Mimosa*-Maize interference experiment

A) Weed free (WF) condition for 2 weeks after sowing (WAS) followed by infestation of *M. diplotricha* till harvest (WF-2-WD).
B) WF for 4 WAS followed by *M. diplotricha* infestation till harvest (WF-4-WD).

C) WF for 6 WAS followed by *M. diplotricha* infestation till harvest (WF-6-WD).
D) WF for 8 WAS followed by *M. diplotricha* infestation till harvest (WF-8-WD).
E) Complete *M. diplotricha* infestation throughout crop growth (WF-0-WD; weedy).
F) *M. diplotricha* infestation for 2 WAS followed by WF till harvest (WD-2-WF).
G) *M. diplotricha* infestation for 4 WAS followed by WF till harvest (WD-4-WF).
H) *M. diplotricha* infestation for 6 WAS followed by WF till harvest (WD-6-WF).
I) *M. diplotricha* infestation for 8 WAS followed by WF till harvest. (WD-8-WF)
J) Complete weed free throughout crop growth (WD-0-WF; weedfree).

Data were collected and analysed using analysis of variance (ANOVA) and means separated using Fisher's least significant differences (LSD) at 5% level of significance.

RESULTS

Effect of acid scarification and boiling water treatments on *Mimosa diplotricha* seeds at germination.

The germination of the seeds increased with increase duration in acid from 20% germination at five minutes to 71% seed germination at 60 minutes after 24 hours in the first trial of the experiment. Germination increased in each Petri dish up to 96 hours after which there was no further germination of the seeds (Table 1). The same trend was observed in the second trial whereby the seeds tolerated acid up to 120 minutes with 100% germination after 24 hours (Table 1). In both trials, the seeds reached peak of germination after 96 hours.

For the boiling water treatments, germination decreased with increasing duration in hot water. The treatment with 10 seconds had 93.33%, while, 60 seconds had 65.0% seed germination after 48 hours. At 96 hours germination in 10 seconds remained the same but the 60 seconds had increased to 66.7% (Table 2).and 60 s The 10 seconds and 15 seconds were not significantly different but significantly better than 45 and 60 seconds treatment at 96hours (Table 2).

Effect of varying duration of *Mimosa diplotricha* interference on the growth parameters of maize

Plant height

At 8 weeks after planting (WAP), maize plant free of interference (WD-0-WF) with *M. diplotricha* had the highest mean height of 158.17±4.76 cm/plant, which was significantly taller than those that were free of Mimosa for the interval of 0 and 2 weeks and those that were infested with Mimosa for the initial 6 and 8 weeks. However, it was not significantly taller than maize plants that were weedfree for the initial 4, 6, 8 WAP (WF-WD) and those that were weedy for the initial 2 and 4 weeks (Tables 3 and 4). The same trend was observed in the second trial with the maize plant free of interference (weedfree) being the tallest with 168.10±7.28 cm/plant (Tables 3 and 4).

Stem diameter

The stem diameter of maize varied from 1.327±0.19 cm (first trial) and 1.39±0.05 cm (second trial) for weedfree (wd-0-wf) treatment to 1.22±0.03 (first trial) and 1.20±0.55 (second trial) in the weedy (wf-0-wd) treatment (Tables 3 and 4).

In the weedy all through (wf-0-wd), there were no significant differences among the stem diameter at both trials (Tables 3 and 4).

Table1: Effect of tetraoxosulphate (VI) acid scarification at varying duration on percentage germination of *Mimosa diplotricha* (n =3)

Duration (Minutes)		24 Hrs	48 Hrs	72 Hrs	96 Hrs
	First Trial				
5		20.0±3.54 a	35.0±7.09a	40.0±3.54a	41.7±4.09a
10		36.0±2.42 a	45.0±1.97a	51.0±2.25a	73.3±2.05b
15		40.0±2.57a	61.7±5.42ab	73.3±2.04ab	76.7±1.43b
20		53.3±2.04ab	68.5±1.47b	75.0±1.42b	78.3±2,04b
30		53.3±1.47ab	76.7±2.04b	80.0±6.14b	80.0±6.14b
60		71.7±8.92b	88.3±7.38b	93.3±5.42b	98.3±2.05c
LSD(p≤0.05)		28.4	27.9	28.8	16.9
	Second Trial				
10		46.7±1.25a	55.0±7.09a	56.7±8.92a	71.7±2.04a
20		86.7±4.09b	88.3±5.42b	90.0±6.40b	90.0±6.14b
30		88.3±5.42b	90.0±3.54b	90.0±3.54b	90.0±3.54b
60		93.3±2.04b	95.0±3.55b	96.0±4.09b	96.7±4.09b
90		96.7±4.09b	96.7±4.09b	100.0±0.00b	100.0±0.00b
120		100.0±0.0b	100.0±0.00b	100.0±0.00b	100.0±0.00b
LSD(p≤0.05)		13.3	10.3	11.17	11.17

(Values are Mean ±Standard Error)

Table 2: Effect of boiling water at varying duration on percentage seed germination of *Mimosa diplotricha*. (n=3)

Duration (Seconds)	24 Hrs	48 Hrs	72 Hrs	96 Hrs
10	81.67±7.95b	93.33±4.96c	93.33±4.96c	93.33±4.96c
15	68.33±7.52b	86.67±2.12bc	90.00±2.59c	90.00±2.59c
30	65.00±3.43b	81.67±3.09b	81.67±3.09bc	81.67±3.09bc
45	61.67±4.03b	76.67±3.35b	76.67±3.35a	76.67±3.35a
60	36.67±7.63a	65.00±4.29a	66.67±5.59a	66.67±5.59a
LSD(p≤0.05)	18.62	10.72	11.85	11.85

(Values are mean of two trials ± Standard Error)

Table 3: Effect of *Mimosa diplotricha* interference on growth parameters of *Zea mays*(First Trial) in a pot experiment at CPEB crop garden in 2014 (n=3)

Period of interference	Plant height (cm)	Stem diameter (mm)	Leaf area (cm^2)
WF-0-WD(weedy)	116.93± 3.81a	1.22 ± 0.03 a	196.40± 8.76 a
WF-2-WD	124.67± 9.92ab	1.28 ± 0.19 a	219.28±2.05 ab
WF-4-WD	147.05 ± 2.32bc	1.29 ± 0.72 a	229.79 ± 4.08 ab
WF-6-WD	147.13 ± 4.96 bc	1.29 ± 0.16 a	254.06 ± 9.17 ab
WF-8-WD	149.27± 1.06 bc	1.30± 0.88 a	265.47 ± 4.55 ab
WD-0-WF(weedfree)	158.17± 3.76 c	1.37± 0.19 a	284.49 ± 8.31 b
WD-2-WF	150.43 ± 1.58 bc	1.35± 0. 91 a	249.54 ± 9.85 ab
WD-4-WF	130.00± 1.95 ab	1.27 ± 1.26 a	230.32 ± 7.08 ab
WD-6-WF	127.07 ± 2.61 ab	1.26 ± 0.45 a	220.45 ± 7.78 ab
WD-8-WF	126.07 ± 4.15 ab	1.26 ± 0.20 a	200.69 ± 2.03 a
LSD $_{(0.05)}$values	27.99	0.19	74.69

Values are means ± standard error
WD –n-WF – weedy for n weeks after planting and subsequently weedfree till harvest
WF- n- WD – weedfree for n weeks after planting and subsequently weedy till harvest

Table 4: Effect of *Mimosa diplotricha* interference on growth parameters of *Zea mays* (Second Trail) in a pot experiment in CPEB crop garden in 2015 (n=3)

Period of interference	Plant height (cm)	Stem diameter (mm)	Leaf area (cm^2)
WF-0-WD(weedy)	120 .00± 3.31a	1.20 ± 0.55 a	138.71± 5.77 b
WF-2-WD	137.00 ± 2.30 ab	1.23 ± 0.01 a	154.91± 3.55 ab
WF-4-WD	157.00 ± 8.18bc	1.25 ± 0.17 a	191.45 ± 3.91 ab
WF-6-WD	157.33 ± 7.58bc	1.28 ± 0.16 a	191.77 ± 6.71 ab
WF-8-WD	159.10 ± 3.13bc	1.29 ± 0.09 a	194.61 ± 4.37 ab
WD-0-WF(weedfree)	168.10 ± 3.28c	1.39 ± 0.02 a	220.71± 5.21 a
WD-2-WF	160.83 ± 7.89bc	1.37 ± 0.05 a	209.98 ± 8.64 a
WD-4-WF	146.33 ±7.21abc	1.26 ± 0.07 a	185.17± 7.00 ab
WD-6-WF	139.00 ± 7.51 ab	1.23 ± 0.04 a	175.87± 0.75 ab
WD-8-WF	138.00 ± 7.20 ab	1.22±0.03 a	154.91 ± 4.82 ab
LSD $_{(0.05)}$values	28.58	0.21	68.20

Values are means ± standard error
WD –n-WF – weedy for n weeks after planting and subsequently weedfree till harvest
WF- n- WD – weedfree for n weeks after planting and subsequently weedy till harvest

The leaf area

The leaf area of maize ranged from 196.4±8.8 cm^2to284.5±8.3 cm^2 in the first trial and from 138.7±5.8cm2 to220.7 ± 5.2 cm^2 in the second trial. In the first trail, the weedfree (wd-0-wf) was significantly larger than the weedy and those infested with Mimosa for the initial 8 WAP (wd-8-wf), whereas in the second trial it was significantly wider than only the weedy plot (wf-0-wd) (Tables 3 and 4) .

Mimosa diplotricha* interference with grain yield of maize and its critical period of interference with *M. diplotrcha.

Season-long interference of *M. diplotricha* (wf-0-wd) with maize reduced grain yield by 48.95% and 52.04% in 2014 and 2015, respectively. Allowing *M. diplotrcha* to interfere with maize plant (wd-wf) in the first 2, 4, 6 and 8 WAS reduced grain yield by 3.4%, 14.66%, 29.06% and 39.39%, respectively in 2014 (Table 5). At 2015, *M. diplotrcha* interference with maize plant in the first 2, 4, 6 and 8 WAS reduced grain yield by 4.69%, 14.84%, 33.13% and 47.68%, respectively (Table 5). Allowing *M .diplotrcha* to interfere with maize after 2, 4, 6 and 8 WAS also reduced grain yield by 35.22%, 24.32%, 11% and 0.22%, respectively at 2014 (Table5), while at 2015 it reduced grain yield by 38.22%, 28.2%, 13.89% and 3.38% respectively (Table 5).The interference of *M. diplotrcha* reduced grain yield across the weeks.

From the study, the critical period of *M. diplotrcha* removal in maize for the two growing seasons was less than four weeks and the critical weed free period is beyond 6 WAS (Fig.1).Therefore to avoid grain yield loss < 10% due to *M. diplotricha* interference it must be kept free of *M. diplotricha* between 3WAS and 6WAS (Fig.1).

Table 5: Effect of *Mimosa diplotricha* interference on maize grain yield reduction relative to weedfree plots in 2014 and 2015 growing season.

Treatments	2014 Grain yield	2014 % Grain yield reduction	2015 Grain yield	2015 % Grain yield reduction	% Mean Grain yield reduction of 2yrs
WF-WD(weedy)	11.42	48.95	10.92	55.12	52.04
WF-2-WD	14.48	35.27	15.03	38.22	36.74
WF-4-WD	16.93	24.32	17.47	28.2	26.26
WF-6-WD	19.91	10.99	20.95	13.89	12.44
WF-8-WD	22.22	0.22	23.67	2.71	1.47
WD-0-WF(weedfree)	22.37	nil	24.33	Nil	nil
WD-2-WF	21.61	3.4	23.19	4.69	4.05
WD-4-WF	19.09	14.66	20.72	14.84	14.75
WD-6-WF	15.87	29.06	16.27	33.13	31.095
WD-8-WF	13.56	39.39	12.73	47.68	43.54

WD –n-WF – weedy for n weeks after planting and subsequently weedfree till harvest
WF- n- WD – weedfree for n weeks after planting and subsequently weedy till harvest

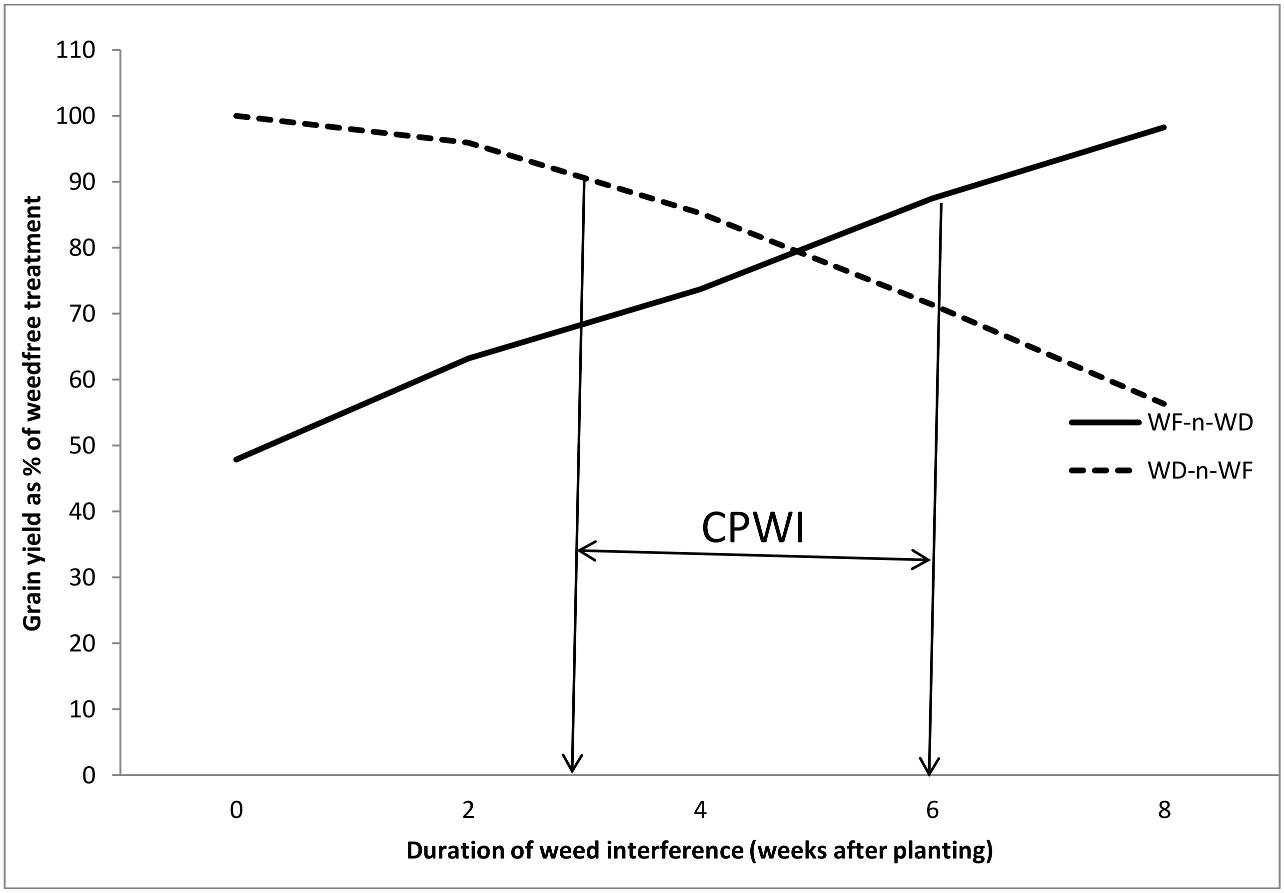

Fig.1. The critical period of interference (CPWI) of *M. diplotricha* with mean grain yield of maize expressed as percentage yield relative to weedfree control in 2014 and 2015.
(WD –n-WF = weedy and subsequently weedfree, WF –n-WD = weedfree and subsequently weedy)

DISCUSSION

Exposure of *M. diplotricha* seeds to tetraoxosulphate (vi) acid and boiling water increase germination. Similar observation was made by Karimmojeni,*et al*. (2011) on the effects of tetraoxosulphate VI acid treatment on dormancy breaking and germination of *Lepidium latifolium* and on the germination of *Vitellaria paradox* in hot water Iroko,*et al*. (2013). The dormancy of *M.diplotricha* seeds in this study might be as a result of hard seed coat of *Mimosa diplotricha* seeds which is a major characteristic of leguminous seeds in the family Fabaceae.

Seed coat dormancy makes the seed impermeable to water and oxygen due to hard external layer of waxy cuticle substance and this makes the seed to survive the dry period when germination and growth conditions are unfavourable (Das, 2011).

Acid or hot water treatment of leguminous seeds has been reported to remove and break the hard waxy layer in a similar manner to the breakdown of the layer by micro-organisms in the soil (Das, 2011). The improved germination of the seeds after hot boiling water treatment could also be attributed to the usually germination of seeds immediately after the dry season as the rains starts, in Nigeria as most farmers usually set bush on fire after the dry season to begin the next planting season giving the seeds the temperature to crack, and becoming permeable to water thereby facilitating germination. Delton,*et al*. (2013) also reported profuse germination of *Corchorus olitorius* seeds after bush burning followed by the first rains. Baskin (2003) observed that hard seed coat of some *Acacia* species seeds cracked and became permeable to water and oxygen due to the effect of fire, while Majd,*et al*.(2013) also reported germination of *Prosopis* sp seeds treated in hot water up to ten minutes to mimic its germination after exposure to fire in nature. The heat provided in combination with the water might have broken the hard seed coat of *Mimosa diplotricha* seeds or disrupt its seed coat and thereby enhanced permeability to water facilitating germination.

The interference study of *M. diplotricha* on the growth of *Zea mays* revealed that *M. diplotricha* decreased maize plant height as plants that were free of *M. diplotricha* had significantly higher height than those interfered with the weed. The result revealed that as the period of weed interference increased there was decrease in plant height. This observation was in agreement with the report of Takim (2012) and Isik *et al.* (2006) that maize grown on weedy plots had height significantly lower than in weed-free plots in weed-maize competition.

Mimosa diplotricha interference with maize also revealed that as the weed interference increased, maize leaf area decreased. This is in line with the findings of Chikoye,*et al.* (2008) that reported that leaf area of maize in weed-free plots were 1.4 times higher than weedy plots due to competition. This could be due to the fact that competition for available nutrients between *M. diplotricha* and maize retarded vegetative growth since resources available to maize might have limited performance of basic physiological processes that would have enhanced growth and development. Reductions in plant height and leaf area of maize are more severe in weed competition due to low nutrient availability (Evans,*et al*., 2003).The critical period of *Mimosa diplotricha* interference in this study for maize plant was between 3 weeks after sowing and 6weeks after sowing which was at the vegetative growth period of the maize planted. This is in line with the findings of Zimdahl (2004) where he reported the critical period of weed interference in maize to also be between 3 weeks after sowing and 6 weeks after sowing, while, Iiham,*et al.* (2009) found the critical period of weed interference in maize under the Mediterranean conditions to be between 2 weeks after sowing and before silking time. Nevertheless, this is in contrary to the findings of Isik,*et al*. (2006) where the critical period of weed interference in maize is between zero days to five weeks after emergence. Hallford,*et al.* (2001) reported critical period of weed interference in maize to be from six leaf stages to thirteen leaf stages. The variations reported in the critical period of weed interference for maize by various workers could be due to differences in environmental conditions, weed type, density and duration of association (Ogunyemi,*et al*., 2001;Isik, et *al*., 2006). Usually the end result of weed interference in maize is loss in grain yield and the magnitude of loss in grain yield due to weed infestation depend on weed flora, weed density, and stages of the crop growth (Takim, 2012). Also, between three and six weeks after sowing can be regarded as the active vegetative stage, tasseling stage and close to cob forming and filling stage as an early maturing cultivar of 75 days was used. Weed infestation at this stage will affect the grain yield as the competition for nutrient and water is increased and making less assimilate apportioned for vegetative growth and cob formation. Therefore, *M. diplotricha* must be either removed at sighting in maize plots or rogued so as to avoid yield loss. This confirms the reports of Ogunyemi,*et al*. (2001) and Adelusi,*et al*. (2006) that weed type play a crucial role in determining the effect of weed interference on the performance of a crop.

Hence, to avoid grain yield loss of >10% due to *M. diplotricha* interference, maize field should be kept free of *M. diplotricha* between 3 weeks after sowing and 6weeks after sowing. Weeds emerging before 2 weeks after sowing and those that emerged at 6 weeks after sowing may not affect yield in maize.

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