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COMPARATIVE EFFICACY OF DIFFERENT PLANT MATERIALS *P.biglobosa* AGAINST WHITEFLY *(Bemisia tabaci* (Genn) INFESTATION ON TOMATO (*Lycopersicon Lycopersicum* L.)

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ABSTRACT

Field experiments were conducted during the dry seasons of 1999 and 2000 to compare the efficacy of two different plant materials against whitefly *(Bemisia tabaci* (Genn) infestation on tomato (*Lycopersicon Lycopersicum* L.) at the Department of Crop Protection teaching plot, Institute for Agricultural Research, Ahmadu Bello University, Zaria. Further experiments were conducted during the 2001 and 2002 dry seasons to determine the minimum concentration dosage for any of two of the materials found to be effective. The two plant materials evaluated are Locust bean, *P. biglobosa* fruit pericarp, *P. biglobosa* Yellow mealy pulp, untreated plots and the standard check insecticide *(cypermethrin + dimethoate)*. The experiment consists of four treatments replicated four times using the Complete Randomized Block Design (CRBD). The *P. biglobosa* fruit pericarp, was effective at 15% concentration against whitefly population. The performance was as good as that of a conventional chemical insecticide, Sherpa plus *(Cypermethrin + dimethoate)*. The *P. biglobosa* Yellow mealy pulp was less effective being slightly better than the untreated control. When different concentrations of *P. biglobosa* fruit pericarp extracts - 100g/litre, 75g/litre 50g/liter and 25g/litre, which were equivalent of 10%, 7.5%, 5.0% and 2.5% w/v respectively were tested against whitefly on tomato, their efficacy in reducing whitefly population on tomato increased with increase in concentration of extract. The efficacy of the aqueous extracts of fruit pericarp at 100 g/litre of extract were significantly higher $P < 0.05$ than lower concentrations.

Keyword: Insecticide**,** *P. biglobosa* (Fruit pericarp)**,** Tomato**,** Whitefly**,** *P. biglobosa* pulp

1. INTRODUCTION

Tomato, *Lycopersicon lycopersicum* L. (Family: Solanaceae) is a widely grown fruit the world over (Agrios, 2005). It is a native to South America (Nonneoke, 1989), but was introduced into West Africa by slave trade and traders fromWest Indies to Portuguese (Tindall, 1988). Global production is about 89.9 million metric tonnes from an area of about 3170,000 (Samuel *et al*., 2011) very popular vegetable throughout Nigeria. Nigeria is the second largest producer in Africa (Bodunde *et al.*, 1993). It can be pressed to paste and juice and for drinks (Babalola *et al.*, 2010). Tomato is rich in vitamins (John *et al.*, 2010) minerals and lycopene an excellent antioxidant (Osemwegie *et al.*, 2010) that helps to reduce the risk of prostate and breast cancer. The tomato fruit is an indispensable constituent of the daily diet of over 100 million Nigerians. It is used in the preparation of soups and stews, which are essential complements to the staples based on cereals and root crops. The seeds upon extraction contain 24% oil. The residue is used in livestock feed and fertilizer (Gerald and Frank, 2005). Tomato production has greatly increased in Nigeria because of its high demandand revenue return. Tomato production in Nigeria is essentially restricted due to high temperature, humidity and pests attack (Erinle, 1989; Umeh *et al*., 2002). The usefulness and popularity of tomato is recognized both at national and international levels. Unfortunately, the production of this important crop is hampered by a number of pests and diseases, a vector of a number of tomato viral diseases, root-knot nematode and leaf beetles (NRI, 1996, Umeh *et al.*, 2002). The whitefly is of particular importance because apart from sucking sap from tomato plants and reducing plant vigour, it also transmits viral diseases, resulting in drastic reduction in yield. The use of chemical pesticides in the management of crop pests cannot be ruled out; it would not be wise to depend entirely on them as the solution to all pest problems. There is a need to find cost-effective, environmentally friendly management options. The use of plant materials with insecticidal properties is

one of such options and this fact necessitate the present investigation.

The objectives of this study, were to compare the efficacy of *P. biglobosa* fruit pericarp extract powder and *P. biglobosa* yellow mealy pulp powder against the whitefly *(Bemisia tabaci* Genn) ; on tomato ; and to determine the minimum dosage of one of the plant material found effective for the management of whiteflies on tomato.

2. MATERIALS AND METHODS

The study was conducted in two different locations namely at the Institute for Agricultural Research Irrigation site and Crop Protection Department student Teaching plot, Faculty of Agriculture, Ahmadu Bello University, Zaria, during the 1999/2000, 2000/2001 and 2001/2002 dry seasons respectively.

Nursery beds were prepared in front of the student Teaching Plot of the Crop Protection Department. Tomato variety sown was a hybrid Roma VF. The seeds were drilled in rows 20cm apart on 1m x 1.5m bed and then covered lightly with soil in order not to expose or displace the seeds. After this, 20 g of Carbofuran (Furadan®) was applied on each bed, which was later covered with dry grass (mulch) before watering. Carbofuran was applied as prophylactics for termite control, since termites are usually attracted by dry grasses, which was meant to protect emerging seedlings. After complete emergence of the seedlings, the grass (mulch) was removed. This removal was done to enable adequate sunlight unto the seedlings. A week later, 35g of fertilizer (NPK 15:15:15) was sprinkled on the beds to enhance seedling development. Hand weeding and watering continued until when the seedlings were due for transplanting after three weeks.

The experiment consisted of 16 plots. *P. biglobosa* (fruit pericarp), *P. biglobosa* yellow mealy pulp, untreated and standard check (*Cypermethrin* + *Dimethoate*} were replicated four times and were laid out in a Randomized Complete Block Design. The plots measured 1.3m x 3m with a 1m guard row between plots .The tomato seedlings were removed from the nursery bed at the age of three (3) weeks and were transplanted unto the field plots in the 4th weeks of age, 35g. Fertilizer (NPK 15:15:15) was applied in band and covered in small trench of about 2 – 3cm round the tomato plants two weeks after transplanting.

Prior to the extraction, the air dried fruit of *P. biglobosa* fruit pericarp and *P. biglobosa* yellow mealy pulp were put into porcelain, mortar and pestle each and were grounded into powder. 150g of this powder were soaked in 1 litre of water. The soaked extract was left to stand overnight prior to the application on the field. Before spraying, soaked extracts was filtered with muslin cloth and put into labelled plastic bucket, ready for spray in the field.

At early fruiting stage after the tomato had fully established 60 days after transplanting adults were sampled on a per plant basis (Mabbel, 1983). On each plot six plants were sampled randomly. The bell jar was placed over each selected plant, which was then tapped and the adults flew up and settled on the inside of the bell jar, where they were counted (Rangarade *et al;* 1980). The sizes of the bell jars were always changed to accompany the growth pattern of the crops. The insect counts were undertaken in the early mornings between 7:30am – 8:00am.

The treatments consisted of 15% aqueous solution of *P. biglobosa* fruit pericarp extract powder and *P. biglobosa* yellow mealy pulp at the first stage of the trials while the insecticide *(cypermethrin + dimethoate)* was administered at the rate of 5 ml/litre of water and the untreated control. There were 16 plots with a plot size of 3 m x 1.5 m each; treatments were laid out in a randomized complete block design (RCBD). 600g of extract *P. biglobosa* fruit pericarp powder and *P. biglobosa* yellow mealy pulp powder were dissolved in four (4) liters of water each and were sprayed to cover four plots, with a knapsack sprayer. A screen was used to prevent drift from one plot to another or from one adjacent area to another in addition to guard-row between rows. Two sprays were applied in each dry season with the first spray made in the 60th days after planting and the second a week later. Insect samplings were carried out a day before and a day after each spray. Data collected were subjected to analysis of variance using ANOVA and means were separated using least significant difference (LSD).

3. RESULTS

Results of the trial conducted to determine the comparative efficacies of two plant materials for the of whitefly infestation on tomato are presented in the table below:

As shown in the tables 1 and 2 above, the result of the effect of different plant materials on whitefly infestation on tomato revealed that, there was no significant differences ($P<0.05$) between 150g/litre of *P.biglobosa* (pericarp) as compared with the control.

P. biglobosa (fruit pericarp), showed high efficacy at the rate of 150g/litre in the control of whitefly infestation on tomato in 1999/2001 dry session dry season. However, there was a significant difference ($P\geq0.05$) between *P. biglobosa* (yellow pulp), untreated control plots and the standard check. Similarly, the efficacy shown between *P. biglobosa* yellow pulp and the untreated control plot did not differ significantly from one another. Hence, *P. biglobosa* (yellow pulp) showed poor efficacy in the control of whitefly infestation on tomato.

In second stage of the experiments in which varying concentrations of *P. biglobosa* (fruit pericarp) were used, the effect of the different concentrations is shown in tables 3 and 4.

Table 3 and 4 above indicate the first and second spraying of different concentrations of *P. biglobosa* (Fruit pericarp) infestation of whiteflies on tomatoes during the year 2000/2001 and 2001/2002 dry seasons. There were significant differences in efficacy of higher concentrations (75g/litre and 100g/litre) when compared with the lower concentrations. Higher concentrations were significantly ($P<0.05$) more effective in reducing the infestation of whitefly than the lower concentrations.

From the Tables 3 and 4, results revealed that as the concentrations of *P. biglobosa* (fruit pericarp) extract increases the insecticidal properties or efficacy in reducing infestation of whitefly tomato also increases.

The efficacy shown at 100g/litre was significantly ($P<0.05$) different from the efficacy lower concentration (25g/litre). There was also a significant ($P<0.05$) difference between 75g/litre and 50g/litre treatments.

4. DISCUSSION

In the field, the build-up of whitefly infestation was observed to be highest at the early stages of tomato growth usually within 7 – 10 weeks after transplanting. The infestation of whitefly fluctuated in a similar pattern in all the plots. However, the efficacies of the two plant materials differed. The present study has revealed insecticidal potential of the aqueous extract of *P. biglobosa* fruit pericarp and yellow pulp against whitefly on tomato. The first treatment in the first experiment at 150g/litre, the aqueous extracts of *P. biglobosa* significantly reduced the infestation densities of whitefly on tomato in all the dry season. It had 66% reduction in infestation of whitefly. While yellow pulp had poor reduction percentage indicating the low efficacy effect of the aqueous extract of yellow pulp on whitefly. This report confirms the statement that, yellow pulp and embedded seeds have no poisonous or toxic properties (Parrot and Gerard (1992), also reported that the yellow pulp of *P. biglobosa* is made into a refreshing drink regarded as being diuretic. Yellow pulp is a comparatively dry, soft substance. The efficacy shown by *P. biglobosa* fruit pericarp was positive, probably due to the presence of alkanoids, seponin and tannins, (Achidi 2005) (personal communication). The insecticidal activity by *P. biglobosa* was also reported for termite control (Umeh, 2001).

5.0 CONCLUSION

The present study, therefore has shown that *P. biglobosa* (fruit pericarp) extract at 100g/litre is a potential insecticides against whitefly infestation on tomato. Since the efficacy and the varying concentrations were conducted under field condition, this extract could serve as either alternatives or complements to chemical insecticides, which are potentially harmful to the users and the environment.

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