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Incidence and Control of Twig Die-Back in Young Cashew in Ibadan (South-Western Nigeria)

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Abstract: A field study was carried out to determine the incidence of twig die back on young cashew plots and its control using the combination of a fungicide and an insecticide. The cashew plot used for the study which was originally established to study the plant performance as affected by nut-size and planting method, was a split plot laid out in randomized complete block with 3 replications. A mixture of Unden 20EC (an insecticide) and Champ D-P (a copper-based fungicide) at 4.0 mL^{-1}: 4 gL^{-1} respectively was monthly sprayed for 4 months while unsprayed cashew trees, 3 m away from the sprayed treatments served as control. Data were collected on the infection (%) and the effectiveness of the sprayed chemical mixture. This was done for 4 months. The result showed that the cashew plants raise from Madras Nut-Size (MANS) (6-8 g) and Jumbo Nut-Size (JUNS) (>16g) had 60.5 and 58.2%, respectively. Between 1 and 3 Months After Spraying (MAS), the disease incidence ranged between 31.8 and 28.8% for MANS, 34.9 and 25.3% for MENS and 29.0 and 19.6% for JUNS treated cashew plants, respectively. In non-treated cashew plant, the disease incidence ranged between 40.8 and 26.7% for MANS and 44.1 and 34.3% for MENS and 44.2 and 29.8% for JUNS, respectively. The reduction in disease incidence in non-treated cashew plants was due to the slow natural recovery of the plant. The planting method had no effect on the disease incidence.

Key words: Cashew plant, twig die-back, disease incidence, nut-size and planting method

INTRODUCTION

Protection of cashew plants against attack by disease pathogens is essential if nut yields are to be obtained. Hence a great deal of research has been directed towards control measures for the numerous agents of insect and disease pests that attack cashew trees, flower, developing fruits and mature nuts and kernels (Grundon, 2000). Besides, Teixeira (1988) recorded over 50 disease pathogens and agents that constitute pests on cashew throughout the world. Although, these pathogens are site-specific (Grundon *et al*., 1998, Grundon, 2000).

When a cashew tree is killed as a result of pathogen or insect attack, the lost yield is very obvious, but less obvious is the amount of nut yield lost from the attack by leaf- and sap-sucking insects in Australia. Strickland and Knight (1992) assessed the nut yield loss from failure to control leaf-feeding and sap-sucking insects. They reported that the treated cashew trees was 39% higher in nut yield than the untreated cashew trees. In a related study, Strickland and Williams (1993) reported a nut yield loss of about 97% in Australia, when the pathogen and the agent (sap-sucking insects) were controlled during panicle emergence. This suggests that, prior to panicle initiation the control measures should commence earlier especially, at the initiation of a flush cycle that precedes the panicle initiation.

Floral shoot die-back, caused by *Lasiodiplodia theobromae* (Pat) Griffin and Maubl, was first reported on cashew, over three decades ago. Since then, a series of research efforts had been made to control the disease (Olunloyo and Esuruoso, 1975). However, little had been given to twig die-back, an equally or more important disease caused by the same organism.

Twig die-back has remained a major factor limiting cashew production for decades in Nigeria, especially on young cashew plots. The infected young cashew trees fail to attain anthesis at 18 months after planting (Hammed and Adedeji, 2005) thus, delaying the commencement of nut yields from the plantation. This study was therefore designed to determine the incidence of twig die-back on young cashew plots and its control using a combination of a fungicide and an insecticide.

MATERIALS AND METHODS

The plot, which was originally planted to study the field establishment of cashew as affected by nut-size and

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planting method, was a split plot in randomized complete block design with three replications. This superimposed experiment was necessitated when about 50% of the infected plants herbage dried due to twig die-back infection. Moreso, 60% of the plant population assumed anthesis at 18 months after planting. Lest the infections interfere with flowering and fruiting, the trial was initiated. Infected shoot of a cashew plant is shown in (Plate 1). The control method applied followed Olunloyo (1983) with some modifications. Champ D-P (Copper based fungicide) and Unden 20 EC (Carbamate-based insecticide) were used instead of Captafol and Gammalin 20 (gamma-BHC) that have been banned due to their deleterious effects on man and his environment. The fungicide and Unden were combined at 4.0 and 4.0 mL^{-1}, respectively. The pesticides combination was sprayed monthly while the unsprayed treatment served as control. The percentage disease incidence was computed thus:

$$\frac{X-Y}{X} \times \frac{100}{1}$$

Where,
X = Total number of twigs.
Y = Number of infected twigs.

The percentage disease reduction was computed

$$\text{Thus, \% disease reduction} = \frac{(\text{incidence in controlled-incidence in infected})}{\text{Incidence in controlled}} \times \frac{100}{1}$$

Plate 1: Cashew plant infected by twig die-back disease (*Lasidiplodia theobromae*) in south-western Nigeria

RESULTS

Generally, if the twig die-back infection on cashew is left unchecked, the infected cashew plants tend to resume flushing with time, through the initiation of new flushes at the lower portion of the infected/dead twigs. The period of resumed flushing, as shown (Fig. 1-8), would have been late for the plant to produce nut yield in that cashew season. This is therefore, a total seasonal yield loss to cashew farmers. However, Ohler (1979) observed that the infected/dead cashew twigs serve as sources of the inoculums to the young flushes.

The cashew plant raised from madras nut-size was observed to be most susceptible in August, 62.7% of its entire shoot (twig) were infected. This was significantly different from cashew plants raised from jumbo and medium nut-sizes that, respectively had 45.2 and 50.5% of their total shoots infected by the disease (Fig. 1). The increased percentage incidence occasioned by the treated cashew plants in September was suggestive of the possibility of the insect vectors sucking on twigs of the young flushes the previous month thus, rendering the spraying ineffective in the three nut sizes. In all, the cashew plants raised from the three nut-sizes used for this study did not respond significantly different ($p<0.05$) to chemical sprayings, i.e., there was no significant ($p<0.05$) variations due to nut-size with respect to percentage incidence of the treated cashew plants. However, among the non-treated cashew plants, the plants raised from madras nut-size recorded lowest percentage incidence (Fig. 1).

The effectiveness of the chemical applications on plants raised from jumbo nut-size of cashew was evidenced throughout the period of applications (Fig. 2) except, in September when the percentage incidence in the treated was significantly ($p<0.05$) higher than that of the non-treated cashew plants raised from the jumbo nut-size. This observation affirms the earlier suggestive reasons that the symptom of the infection might have not become expressed in September because the spraying might be immediately after sucking by the insect vector (Fig. 2).

Besides, Fig. 2 also depict that cashew plants raised from jumbo nut-size have the least natural recovery. Thus, if the infection is left uncontrolled in such plants, no single nut may be harvested in that fruiting season. However, treated and non-treated cashew plants raised from medium nut-size of cashew were not significantly different ($p<0.05$) throughout the period of applications (except in November). This is an indication of its natural recovery rate, but at off-season (Fig. 3). The cashew plants raised from madras nuts had results (Fig. 4) similar to those of the medium nuts in Fig. 3. These plants

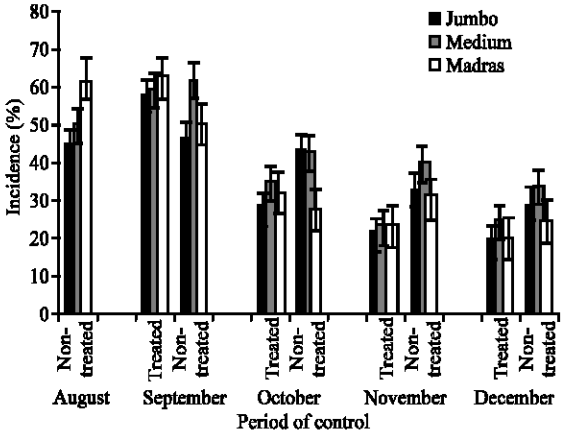

Fig. 1: Control of twig die-back in cashew as affected by nut size in Ibdan

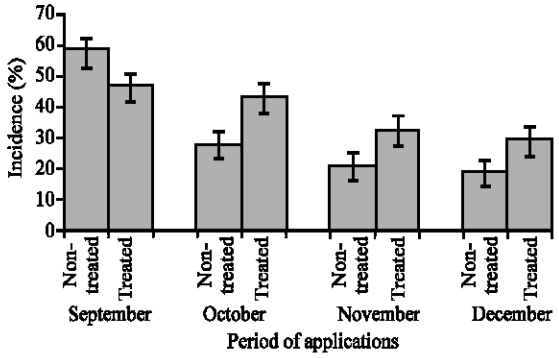

Fig. 2: Effectiveness of insecticide/fungicide mixture applications on the control of twig die-back in young cashew raised from jumbo sized nuts

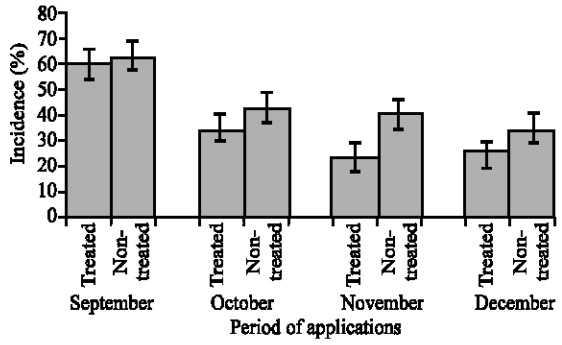

Fig. 3: Effectiveness of insecticide/fungicide mixture applications on the control of twig die-back in young cashew raised from medium sized nuts

recorded the least percentage incidence with time. There was no significant effect in percentage incidence between the treated and non-treated plants of cashew raised from madras nut-size throughout the period of applications (Fig. 4).

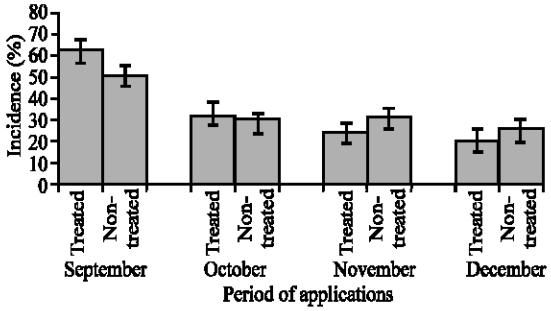

Fig. 4: Effectiveness of insecticide/fungicide mixture applications on the control of twig die-back in young cashew raised from madras sized nuts

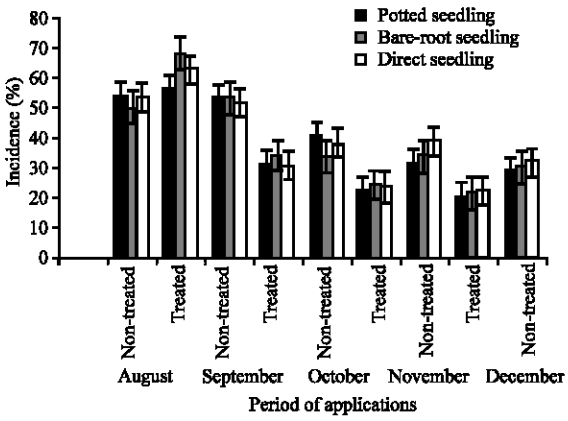

Fig. 5: Control of twig die-back in cashew as affected by planting method in Ibadan

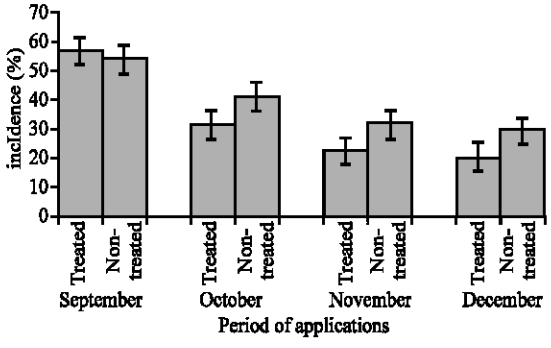

Fig. 6: Effectiveness of insecticide/fungicide mixture applications on the control of twig die-back in young cashew raised through potted seedling

Strickland and Knight (1992), while assessing the nut yield loss from failure to control the sap-sucking insects, reported 39% yield loss compared to the treated cashew trees. In another study, Strickland and Williams (1993) obtained 30.2 g per panicle of cashew nuts from cashew

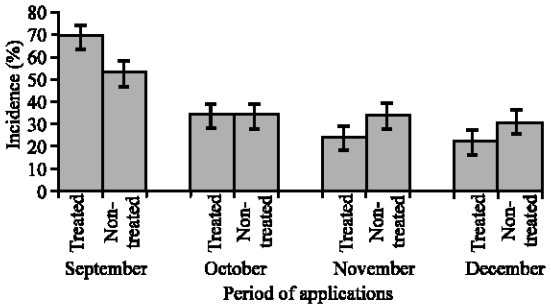

Fig. 7: Effectiveness of insecticide/fungicide mixture applications on the control of twig die-back in young cashew raised through bare-root seedling

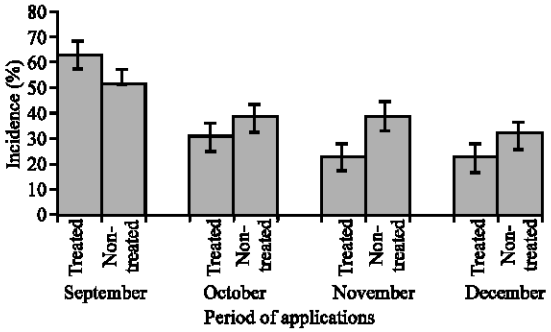

Fig. 8: Effectiveness of insecticide/fungicide mixture applications on the control of twig die-back in young cashew raised through direct seedling

trees treated against the sap-sucking insects as against the 1.8 g per panicle of cashew nuts yielded by the untreated trees of cashew. These sap-sucking insects had earlier been reported to predispose the young cashew twigs to infection by pathogen (*Lasiodiplodia theobromae*) (Olunloyo and Esuruoso, 1975). In this study, the non-treated cashew trees (which naturally recovered through flushing at the basal portion of the infected twigs) flushed at a period when the plant is expected to be fruiting and harvesting supposed to be in progress. In addition, it was observed that, the few cashew fruits borne by the non-treated cashew plants (control) neither matured nor ripe before the commencement of the rains. Therefore, these newly formed fruits and the hermaphrodite flowers became wasted due to rainstorm and rains. These types of immature cashew nuts picked together with the matured nuts, have earlier been implicated to reduce the nut quality and percentage germination of cashew seed-lot (Adeyemi and Hammed, 1993).

The effects of the planting method (potted transplants, bare-root transplants and directly seeded plants) of these cashew plants to the infection rate that was investigated, indicated that, the factor had no significant contributions to the percentage incidence of twig die-back in cashew throughout the period of observations, irrespective of whether the plant is treated or non-treated. Meanwhile, in the month of September, the percentage incidence in the treated plants raised through bare-root cashew seedlings transplanted to the field, was highest (68.8%) which was significantly different ($p<0.05$) from those raised through potted cashew seedlings transplanted to the field (56.5%).

Considering the effectiveness of the chemical spraying, with respect to planting method, it was indicated that, almost throughout the period of applications there were no significant effects ($p<0.05$) in percentage incidence between the treated and non-treated plants of cashew irrespective of the planting method (Fig. 5-8). The exception was in November (Fig. 8) when the percentage incidence was significantly ($p<0.05$) reduced (23.2%) in treated as against the non-treated cashew trees (39.3%).

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