ADVERSE EFFECT OF NEEM OIL ON ARECANUT FRUIT SETTING

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ABSTRACT

Dakshina Kannada and Kasaragod coastal areca belt has been a silent victim for adverse effect of neem on arecanut production since 1997. Neem and similar plant based pesticides have been used as a prophylactic spray against scale infestation from the day of opening of areca spathe at regular intervals. This comes in the way of natural pollination which otherwise is wind mediated by - (i) making the male flowers not to open or dry up fast, (ii) aggravating the temperature effect and (iii) mechanically blocking the entry of pollens into the receptive female flowers. An observatory study in the field and in the laboratory comprising three spray liquids viz., two unbranded but in vogue with the farmers (one neem based and the other cashew nut shell liquid based) and another Neemazal (10,000 ppm Azadirachtin) from EID Parry (I) Ltd. at three concentrations in a CRD model, has confirmed the negative impact of these pesticides on arecanut pollination. Pollens deposited on the control agar media with no spray solution only germinated and hence the phytotoxicity on the areca inflorescence is indicated.

The whole of Dakshina Kannada and Kasaragod areca growing belt has been silent witness for and victim of neem episode in the recent years. Majority of the growers have experienced the bitterness of this particular phenomenon and have been mourning spectators for the phenomenal loss of newly emerging inflorescences with no flowers either male or female- and that too with not much involvement of any kind of infectious disease causing pathogens with inflorescence.

The scale insect infestation has been regularly seen in most of the areca belt and felt as a minor pest of areca due to the reason that it caused minimum damage to the crop. Three species of scale insects are found infesting the leaves and stem while a species of *Chinapsis* is found damaging the Arecanut seedlings extensively (Anon., 1994). The incidence of scale - of which mainly two species, *Aonidiella orientalis* (round in shape) and *Ischnaspis longirostris* (rod shaped) prevailing in the areca gardens (Anon., 1999) - has been observed to be mainly in one or two seasons of the year while the arecanuts e through their developmental stages. Since two-three ars back the scale and such similar sucking insect pests g., mealy bugs) have attained epidemic scale in cer- in pockets.

It is unquestionable that neem is an eco-friendly antifeedant or feeding deterrent (Warthen, 1979) or oviposition deterrent (Coudtriet et.al. 1985) for insects and hence keeps the pests population repelled from the crop. But its wrong usage at inappropriate time and site definitely proves non- productive and the time has been silent witness for this. Availability of neem based products has made the farmers to use them very frequently in their gardens with an over enthusiasm and a guarded conviction of no side effects on plants and ecology. Over cautious attitude by the farmers and improper knowledge on the aftermath have led to the use of these products on newly emerging inflorescences at regular intervals, many a times repeated spray at fortnightly intervals are also not uncommon. Though the scales were noticed in majority of the cases only on developing nuts and not on inflorescences, people were advised to and have used neem oil on inflorescences of all the stages starting from their just unfurling (from the covering spathe) and all along the male and female phases in the course of one month period of their opening. Eventually this has resulted in non-availability of pollens to the receptive female flowers on the neighbouring spadices of other palms. Since the prevailing practice has been spraying all the new inflorescences with either neem or other organic based products at frequent intervals there got created a major physical barrier for the normal opening and anther dehiscence of male flowers and an artificial pollen scarcity is created.

A simple study involving following treatments was undertaken at CPCRI Regional Station, Vittal with an objective of confirming this adverse impact of neem and organo- pesticides on the areca inflorescences. Two

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unbranded combination products - one containing neem as the main and the other cashew nut shell liquid as the major component along with one branded product Neemazal (Azadirachtin) from EID Parry (I) Ltd. have been used in the trial. Hirehalli Dwarf and Mangala palms were utilized from the convenience point of view.

The methodology followed can be briefed as follows. Two sets of just unfurling inflorescences were labelled and utilized for the study with each of the spray combinations mentioned at the normal recommended concentrations. In total six sets of treatments were imposed and observed for the effects in the field in addition to the laboratory studies.

I set of inflorescences - emasculated

Sprayed --- pollinated with

Non sprayed --- pollinated with

------> Sprayed pollens (a) 1

------> Non-sprayed pollens (b) 2 (a) 3 (b) 4

II set of inflorescences

------> Sprayed and left for open pollination ---------5

------> Non-sprayed and left for open pollination ---6

Salient observations can be summed up as below :

* Female flowers when sprayed with the pesticides and then pollinated did not set the fruits irrespective of pollens - either sprayed or non- sprayed.

* Female flowers when pollinated with no spray and normal pollens set the fruits normally and with sprayed pollens there was no fruit set.

* Inflorescence when sprayed with these pesticides and left for open pollination did not set fruits.

* Inflorescences with no spray and on open pollination did set fruits.

* Added to this the inflorescences sprayed frequently with these oily and sticky pesticides did dry up very fast.

* Male flowers got shrivelled within a fortnight after the spray due to the facts that there occurred - added temperature effect, no proper opening of flowers and speedy spread of *Colletotrichum* infection on the inflorescence which otherwise would normally take a month and spare atleast certain female flowers setting fruits on few raches.

Possible reasons for this nonfunctioning of pollination in the sprayed inflorescences could be explained in the following terms.

1. Coming in the way of normal opening of the male flowers (Fig.1).

2. Non spread of pollens in the air while areca is basically wind pollinated crop.

3. Coming in the way of pollens entering into the receptive female flowers due to sticky barrier.

4. Even if certain amount of pollination do happen the aggravated temperature effect due to the oil on the set fruit surface make them shed off with no delay (Fig.2).

5. Fast spread of inflorescence die-back disease causes the inflorescences to dry up fast and this is felt in the farmers' plot also.

Meanwhile, the sticky oil bases have come in the way of pollen entry into the already receptive female flowers thereby creating an artificial herkogamy otherwise a censoring act by man's intervention. This makes the female flowers to shed off with no fertilization within a week or two. This has been the prevailing situation in and around Dakshina Kannada causing the havoc in the growers' circle.

A **confirmatory study** on the **inhibition of pollen germination** was undertaken by the following test at laboratory -

Agar media of 0.1 percent were prepared with boric acid (100 ppm) and sucrose (0.75%). And then a layer of a) azadhirectin in three concentrations, viz., 0.02, 0.04 and 0.06 percent b) unbranded neem oil combination and c) cashew nut shell oil spray combination each at 2, 4 and 6 percent concentrations were put on these media comprising nine treatments along with a control represented by only the medium with distilled water. It was replicated thrice. Male flowers were collected afresh from the plots and grounded to yield pollens by filtering through 250 mm meshed sieve. The pollens were dusted on to these media immediately and observed for their germination under microscope using aceto-carmine stain at an hourly interval.

The observations revealed the facts that pollens dusted on the control medium had germinated in abundance within three hours of deposition while none of the pollens from any of the other treated - media did germinate even after 24 hours (Fig.3). Within the first four

hours of deposition 51.93 percent of pollens germinated in the control (Table 1) with a pollen germ-tube length ranging from 3.88 μ to 155.12 μ (Table 2 & Fig.4). The average pollen tube length was 47.01 μ when observed from 15 fields at random under LP (10X) of a microscope with a calibrated ocular micrometer.

Mean while, some more inflorescences were labelled, emasculated and kept covered for observing the pollen germination on the stigma and pistil region which otherwise were sprayed with the same combinations. When observed after third day of their receptivity and cross-pollination, only the female flowers with no spray and pollinated ones had pollens with lengthy germ-tube. All others had no germinated pollens inside the pistil region when observed after crushing the entire pistil portion along with the stigmatic surface after washing with distilled water.

All these speak very clear and confirmed verdict of neem based pesticide on areca inflorescence and hence a strong caution to the concerned farming community so as to beware of the repercussions of unscrupulous use of any such kind of plant based and oil-based preparations on to the delicate and healthy areca inflorescence. Unfortunate that there have been dozens of unabated neem and other plant based combinations with claims of controlling various pests and diseases from non-scientific groups.

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Reference

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Table 1. Pollen germination measurement in the control treatment

Total number of pollens counted (a)	Number of pollens successfully germinated (b)	Proportion of germinated to non-germinated pollens (P) = (a)/(b)	Standard error (Se)
439	228	0.5193	0.0238

Table 2. Average pollen tube length (μ) measured after four hourse of pollen deposition on the control media

Range	Mean length	Standard Error
3.88 - 155.12	47.01	10.402

Figure 1. Inflorescence showing unnatural drying due to spray with neem oil.

Figure 1. Inflorescence revealing speedy shedding of buttons from the neem sprayed portion.

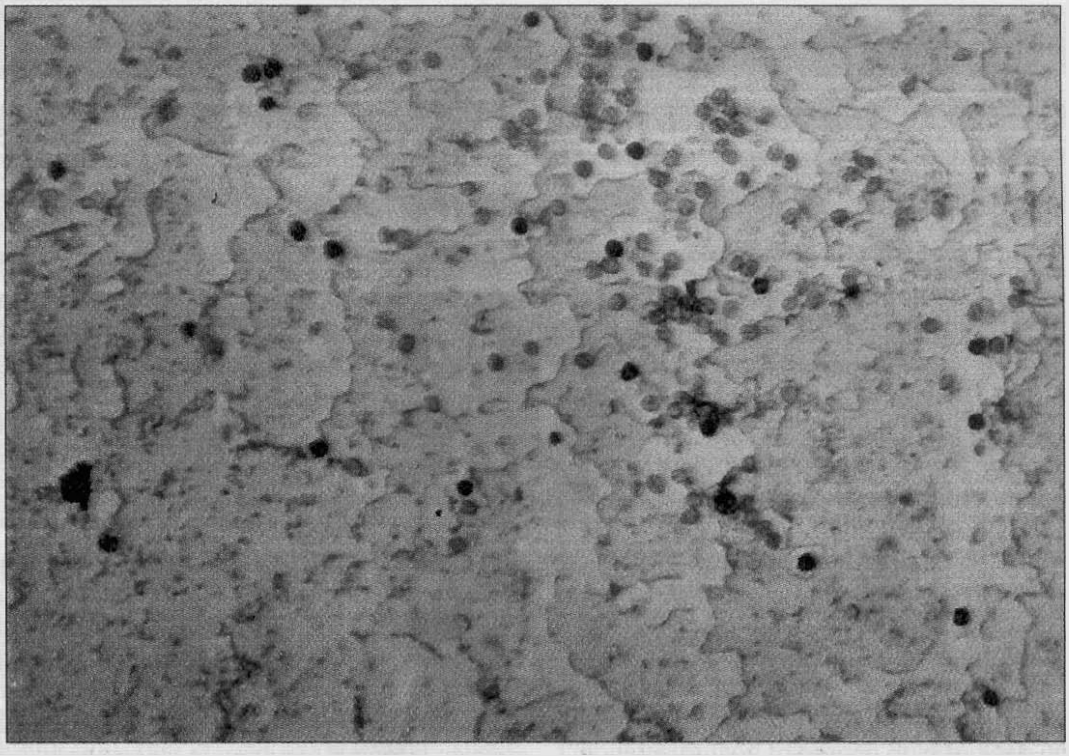

Figure 3. Ungerminated pollens in the media with spray solution observed under 50X magnification.

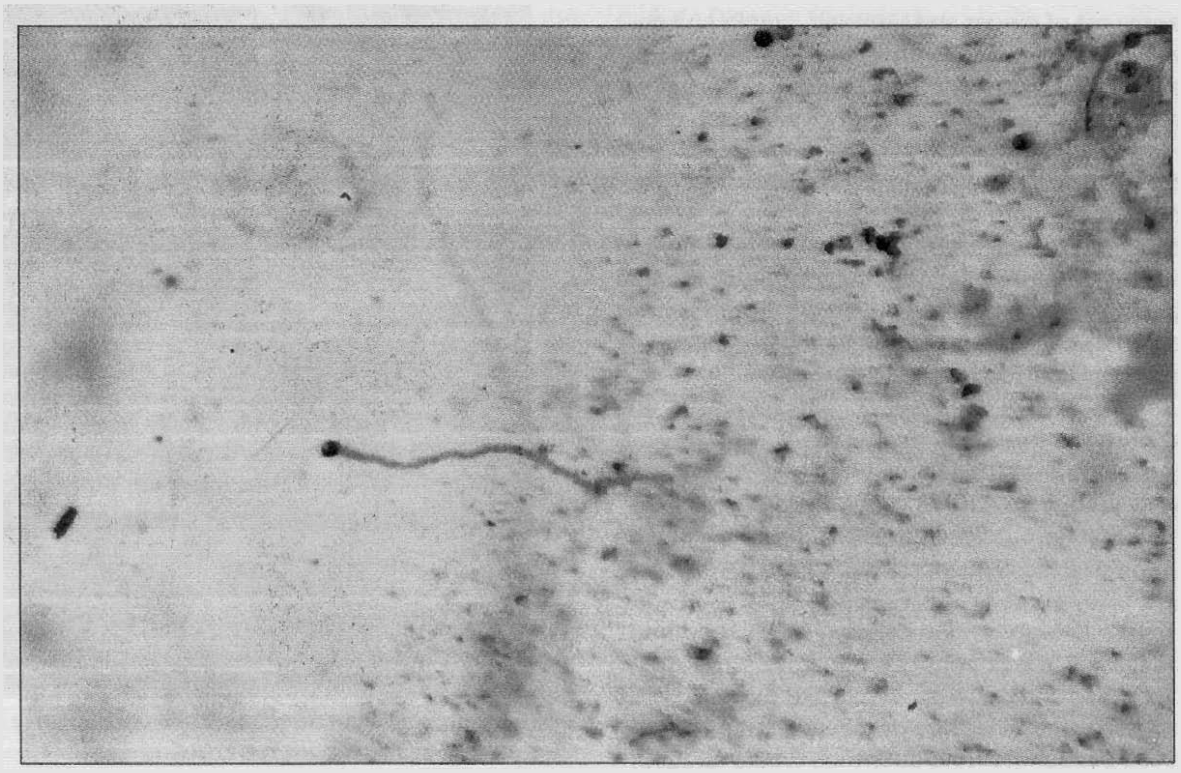

Figure 4. Well germinated pollens in the control media with no spray solution under 50X magnification.