Journal of Agrometeorology 4 (2) : 153-157 (Dec 2002)

Study on the weather relationship of eriophyid mite in coconut

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ABSTRACT

Field study was undertaken during March 2000 to August 2000 at Coconut Nursery garden of Tamil Nadu Agricultural University, Coimbatore, to understand the relationship between weather and nuts affected with eriophyid mite in coconut. The maximum temperature had negative correlation with nuts affected in all the varieties [Tall (east coast), Dwarf (yellow), Tall X Dwarf, Orange, Dwarf X Tall] at three months after spathe emergence; where as positive correlation was obtained for maximum temperature one to two months before spathe emergence in respect of Tall (east coast) and Dwarf x Tall varieties. In general eriophyid mite affected nuts were either positively or negatively influenced by minimum temperature and relative humidity (0722 IST and 1422 IST). From the stepwise regression analysis made, one to two months earlier or one to two months after spathe emergence, wind speed had higher influence on the nuts affected with mite irrespective of varieties except in Tall x Dwarf treatment.

Key words: Coconut, Weather, Eriophyid mite

Climatic condition and its day-to-day change influence pest incidence either directly or indirectly. For developing any pest management programme for a specific agro-ecosystem, information on abundance and distribution of pest in relation to weather parameters is basic requirement. (Chaudhari, *et.al.*, 1999). Advance information on forthcoming weather condition would be useful in developing effective prevention methods against pest incidence. In Tamil Nadu, there is an alarming menace from eriophyid mite's pest in coconut across different agro climatic sub zones. The spread of mites is mostly through wind and it is assumed that in this region southwest monsoon wind might have a greater role. The mites were able to penetrate between the upper and lower tepals and finally to the fruit surface covered by the perianth within a few weeks to a month after fertilization (Howard and Abreu, 1991, Moore and Alexander, 1987) after its deposit on the flowering bunch through physical processes. Earlier reports showed that the tepals were tightly adpressed to the fruit during its first month of development (Howard and Abreu, 1991), so that the perianth gave maximal protection at this stage. As the fruit developed, it became increasingly larger in relation to the perianth, and within about a month spaces developed between the coconut surface and the perianth, which was sufficiently large to permit the entry of coconut mites. With a development cycle from egg to adult of about ten days (Mariau, 1977) mite numbers could build up rapidly.

The fruits of coconuts susceptible to mite got affected throughout the whole development, but the attack was more with matured fruit (10-13 months). In early stage of coconut fruit, mites were found rarely and in small numbers (Hall and Espinoza, 1981, Moore and Alexander, 1987). Hence, a study was initiated at Tamil Nadu Agricultural University (TNAU), Coimbatore to find out the relationship between selected weather parameters and nuts affected with coconut mite.

MATERIALS AND METHODS

In the present investigation the objective was to study the weather relationship of coconut eriophyid mite. Coconut trees of about 25- 30 years old were selected from Coconut Nursery Garden of TNAU for this purpose. Two trees each from five varieties were selected [Tall (east coast)], Dwarf (yellow), Tall x Dwarf, Orange, Dwarf x Tall]. The observations on nuts affected with eriophyid mite were taken from March to August 2000 on monthly basis from the 5th bunch from the top for each variety. Monthly weather data viz., maximum temperature, minimum temperature, rainfall, relative humidity (0722 and 1422 IST) and wind velocity were collected from the records of Department of Agricultural Meteorology, TNAU, Coimbatore, for the concerned period. Correlation analysis was made to assess the relationship between weather parameters and eriophyid mite affected nuts on the 5th bunch. Since, wind was known to play a vital role on the dispersal of mite, stepwise regression analysis was administered to identify which month's wind values could be associated with higher mite incidence in coconut nuts. For this purpose, percentage of nuts affected with mite and different months wind speed data were used. The data are presented in Table1.

RESULTS AND DISCUSSION

Rainfall

The rainfall received was 0, 19.9, 13.9, 27.4, 15.7, and 163.6mm respectively for March, April, May, June, July and August 2000, where as normal rainfall of these months were 15.0, 50.0, 86.2, 39.5, 78.4, and 35.0 mm respectively. The rainfall during study period was below the normal except in August 2000. Correlation analysis showed that rainfall had no significant relationship with the nuts affected with mite during the study period. This indicated that if the rainfall amount was below normal, it did not have any greater influence on the nuts affected with mite.

Maximum temperature (T_{max})

A negative correlation was obtained between T_{max} and eriophyid mite affected nuts at three months after the emergence of spathe irrespective of the varieties evaluated. In respect of Tall (east coast) variety the negative relationship could be observed even from the first month after emergence of spathe. Interestingly however, positive correlation existed between Tmax and nuts affected before two months of spathe emergence. In respect of Dwarf x Tall variety such a relationship was found to exist during the month of spathe emergence and one month earlier to opening of bunch also. The coconut variety Dwarf (yellow) also exhibited positive relationship between Tmax and eriophyid mite affected nuts from two months in advance of spathe emergence.

Minimum temperature

The impact of minimum temperature on mite was assessed. The results (Table 1) revealed that there was no relationship for Tall x Dwarf

Table 1: Correlation between mite affected nuts and weather parameters

Varieties\Weather parameters		Tall X Dwarf	Tall (east coast)	Dwarf X Tall	Dwarf (yellow)	Orange
Max. Temp. (°C)	0	NS	NS	0.630 *	NS	NS
	-1	NS	NS	0729 *	NS	NS
	-2	NS	0.706 *	NS	.566 *	NS
	+1	NS	-0.712 *	NS	NS	NS
	+2	NS	-0.787 **	NS	0.647 *	NS
	+3	-0.708 *	-0.673 *	-0.582 *	-0.779 *	-0.684 **
	+4	NS	NS	NS	NS	NS
	+5	NS	NS	NS	NS	NS
Min. Temp. (°C)	0	NS	NS	0.546 *	0.775 *	NS
	-1	NS	0.869 **	NS	0.629 *	NS
	-2	NS	0.813 *	NS	NS	NS
	+1	NS	NS	0.715 *	NS	NS
	+2	NS	NS	NS	NS	NS
	+3	NS	-0.720 *	NS	NS	NS
	+4	NS	NS	NS	NS	NS
	+5	NS	NS	NS	NS	NS
Relative humidity (%) 07.22hrs	0	NS	NS	-0.543 *	-0.602 *	NS
	-1	NS	-0.590 *	NS	-0.766 **	-0.577 *
	-2	NS	-0.813 **	NS	-0.752 **	-0.619 *
	+1	NS	NS	NS	NS	NS
	+2	NS	NS	NS	NS	NS
	+3	NS	0.725 **	NS	NS	NS
	+4	NS	NS	NS	NS	NS
	+5	NS	NS	NS	NS	NS
Relative humidity (%) 14.22hrs	0	NS	NS	NS	NS	NS
	-1	NS	NS	-0.561 *	NS	NS
	-2	NS	NS	-0.547 *	-0.558 *	NS
	+1	NS	0.781 *	NS	NS	NS
	+2	0.566 *	NS	0.555 *	NS	.0602 *
	+3	0.553 *	NS	NS	0.729 *	NS
	+4	NS	NS	NS	NS	0.562 *
	+5	NS	NS	NS	NS	NS
Wind velocity	0	NS	0.551 *	NS	0.5699 *	0.6533 *
	-1	NS	0.633 *	NS	0.6397 *	0.6795 *
	-2	NS	0.720 **	NS	NS	0.5749 *
	+1	NS	NS	NS	NS	NS
	+2	NS	NS	NS	NS	NS
	+3	NS	NS	NS	NS	NS
	+4	NS	NS	NS	NS	NS
	+5	NS	-0.513 *	NS	NS	NS

NS = Non significant
* = P=0.05
** = P= 0.01

0 = Spathe emergence month (March 2000)
Numerals -1 to +5 refer to number of months before (-ve) and after (+ve) opening of bunches during March 2000

and Orange varieties. Where as, Tall (east coast) variety showed positive correlation for one, two months earlier to spathe emergence, and negative correlation existed at three months after spathe emergence. In respect of Dwarf x Tall variety positive correlation existed during the month of emergence as well as one month after spathe emergence.

Relative humidity (0722 IST)

The results of morning relative humidity indicated no relationship for Tall X Dwarf variety. In respect of Tall (east coast) variety negative relationship could be observed even from one and two months earlier to spathe emergence and with a positive relationship at three months after spathe emergence. In Dwarf x Tall variety negative relationship was observed for the month of spathe emergence. In respect of Dwarf (yellow) and Orange varieties negative relationship was observed one and two months earlier to the spathe emergence. (Table 1)

Relative humidity (1422 IST)

The impact of morning relative humidity was not observed in Tall X Dwarf variety. However, this variety for evening relative humidity showed positive relationship at two and three months after spathe emergence. In respect of Tall (east coast) variety positive relationship was noted one month after spathe emergence. In case of Dwarf X Tall, negative relationship was observed at one and at two months earlier to spathe emergence. (Table 1) and a positive relationship existed at two months after spathe emergence. In Dwarf (yellow) variety negative relationship was noted two months before spathe emergence and positive relationship was seen at three months after spathe emergence. For orange variety positive correlation could be observed at two and four months after spathe emergence.

Wind velocity

The effect of wind velocity was assessed on different varieties of coconut. The results revealed that there was no relationship between wind velocity and eriophyid mite affected nuts for Dwarf X Tall and Tall X Dwarf varieties. But, in Tall (east coast) positive relationship could be observed during the month of spathe emergence, one and two months before spathe emergence, whereas negative relationship was seen at five months after spathe emergence. In the case of Dwarf (yellow) and Orange varieties positive relationship could be observed during the month of spathe emergence, one month before spathe emergence.

Stepwise regression analysis revealed that the wind velocity could not influence the Tall X Dwarf variety but in case of Dwarf X Tall and Orange varieties one month before and three months after spathe emergence wind could influence about 69.55 percent and 69.97 percent of mite affected nuts respectively. Though there was no significant correlation (Table 1) between wind velocity with mite affected nuts incidence in Dwarf X Tall, the above said month wind seemed to have indirectly influencing the mite affected nuts.

For Dwarf x Tall variety the regression equation is

$$Y = -2.1684 + 3.0046X_1 + 3.1855\ X_2 \qquad (R^2 = 0.6955)$$

and for Orange variety

$$Y = 49.3274 + 1.9746\ X_1 + 1.2433\ X_2 \qquad (R^2 = 0.6997)$$

where

Y = Percentage of mite affected nuts

X_1 = Wind at one month before spathe emergence

X_2 = Wind at Three months after spathe emergence

In the case of Tall (east coast) variety, among different months wind speed of two months earlier to spathe emergence and two month after spathe emergence greatly influenced 75.09 percent of mite affected nuts.

$$Y = 44.1039 + 2.4363X_1 + 1.3943X_2 \quad (R^2 = 0.7509)$$

where

Y = Percentage of mite affected nuts

X_1 = Wind at two month earlier spathe emergence

X_2 = Wind at two month after spathe emergence

In Dwarf (yellow) variety, wind at one, two months before and two and three months after spathe emergence could influence about 92.94 percent of mite affected nuts

$$Y = -7.5724 + 1.5523X_1 + 2.9270X_2 + 1.6185X_3 + 1.6012X_4 \quad (R^2 = 0.9294)$$

where

Y = Percentage of mite affected nuts

X_1 = Wind at one month before spathe emergence

X_2 = Wind at two month before spathe emergence

X_3 = Wind at two month after spathe emergence

X_4 = Wind at three month after spathe emergence

From the study it is concluded that the weather parameters taken for the study had either positive or negative correlation with the nuts affected by eriophyid mite except rainfall in terms of below normal events. The weather that prevailed at the time of emergence of spathe as well as pre and post spathe emergence month had influenced the mite population that led to nuts being affected. The coconut variety Tall X Dwarf was least affected by mite interms of nuts affected due to the weather elements.

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