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ASSESSMENT OF YIELD LOSS DUE TO THRIPS (THYSANOPTERA: THRIPIDAE) IN CHILLI

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ABSTRACT

Thrips (*Scirtothrips dorsalis* Hood) are the most serious pest causing considerable yield loss in chilli cultivation especially during the *yala* season. Most of the research work conducted on chilli thrips were mainly focused on development of control measures in Sri Lanka. However, to our knowledge no quantitative data are available on yield loss caused by chilli thrips. Therefore, experiments were conducted in two consecutive *yala* seasons in 1998 and 1999 to estimate the yield loss due to thrips. The chilli variety *Arunalu* was used and the different damage severity levels were created by giving different number of chemical (imidacloprid) applications. The highest severity index of 96 was recorded under untreated conditions for both *yala* seasons while the lowest severity index of 40-44% was recorded with six - eight sprays. A linear relationship was observed between thrips damage severity and yield. Thrips cause significantly higher yield loss up to 53% or more under untreated conditions.

KEYWORDS: Chilli, Thrips, Yield Loss

INTRODUCTION

Chilli (*Capsicum annum* L.) is one of the most important cash crops grown in the dry zone of Sri Lanka. The total extent cultivated under chilli was around 30,000 ha in early 1990's. However, during the past few years the extent cultivated under chilli has declined mainly due to pest problems and it was reported to be around 19,000 ha in 2000 (Central Bank, 2000). Leaf curl complex is the major problem in chilli cultivation especially during *yala* season. It is caused by feeding of thrips (Johnpulle, 1939), mites and aphids or viruses transmitted by whitefly (Fernando and Pieris, 1957; Pieris, 1953), of which thrips are the most important causing considerable damage leading to heavy yield losses. Thrips are minute, slender insects usually a few millimeters long (Lewis, 1997) and they feed on upper surface of tender leaves and suck the sap. Then the leaves curl upward. Subsequently, bronze patches develop along the midrib and leaves drop prematurely. In severe infestations, thrips damage the pods. The attacked pods develop a purple discolouration and subsequently cracked areas appear on the damaged pods (Johnpulle, 1939; Wijerathne Banda, 1994).

Several thrips species are reported to damage chilli crop. Johnpulle (1939) identified *Scirtothrips dorsalis* as the only species of thrips associated with chilli leaf curl while another two species of thrips (*Haplothrips gowdevsi* and *Franklinella sulphurea*) have been identified in Sri Lanka (Anon, 1963). However, Wijerathne Banda (1997) reported that four species of thrips (*Thrips palmi, Scirtothrips dorsalis, Franklinella schultzei* and *Megalurothrips* spp.) are associated with chilli foliage and flowers.

Yield losses caused by thrips in several crops have been reported by various workers. In 1930's, 80% of the citrus crop in California (Quayle, 1938) and 50% in Zimbabwe (Hall, 1930) were damaged by *Scirtothrips* spp. The yield losses in cassava from thrips were 11% and 15.4% for tolerant and susceptible cultivars respectively (Schoonhoven and Pena, 1976). Bal (1991) reported that 30-90% loss was caused by *Megalurothrips* spp. in cowpea. The yield losses caused by *Thrips tabaci* in onions in 1988 and 1989 were reported as 34% and 43% respectively (Fournier *et al.*, 1995).

Most of the research work conducted on chilli thrips in Sri Lanka were mainly focussed on development of control measures. However, these control measures have not been worked out based on yield loss and to our knowledge no quantitative data are available on yield loss caused by chilli thrips. Therefore, a study was conducted in two consecutive *yala* seasons at Field Crops Research and Development institute, Maha Illuppallama to estimate the yield loss due to thrips and to find out the relationship between thrips damage severity and yield.

MATERIALS AND METHODS

The experiments were conducted in two consecutive *yala* seasons (1998 and 1999) adopting randomized complete block design with four replications. The chilli variety *Arunalu* was used. Five-week-old seedlings were transplanted on 20th May for the experiment conducted in *yala* 1998 and on 02nd June for the experiment conducted in *yala* 1999. The plot size was 4.8 × 4.5 m and the spacing followed was 60 × 45 cm for both experiments. All the cultural practices recommended by Department of Agriculture for chilli cultivation were followed. Different severity levels were created by giving 0, 2, 4, 6 and 8 spray applications of imidacloprid (750 ml/ha) at 7 d intervals. Spraying was started at 5% leaf curl incidence at 3 and 5 weeks after transplanting (WAT) during *yala* 1998 and 1999 respectively. Plants were examined daily to record the type of insect damage to the crop. Since no other major insect infestations were developed other than thrips during both seasons, any other insecticidal protection was not given.

Seven days after each spraying, severity of thrips damage was rated in 16 randomly selected plants in each treatment according to the following scale ranging from 1-9. (Table 1).

Scale	Damage Severing
1	No symptoms
2	1-5% leaves affected
3	6-10% leaves affected
4	11-20% leaves affected
5	21-30% leaves affected
6	31-40% leaves affected
7	41-55% leaves affected
8	56-75% leaves affected and stunting
9	>75% of leaves damaged, pronounced stunting, severe leaf shedding or plant death

Severity index was calculated using the following formula:

$$P = \Sigma (V.n) / N.Z \times 100$$

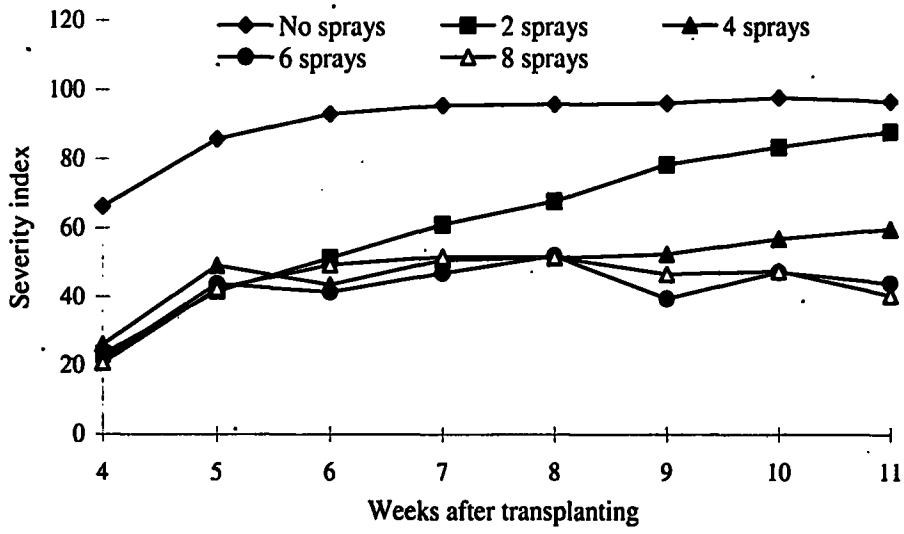
P = Severity index n = Number of plants having the same score
V = Score value N = Number of plants observed
Z = Number of score levels

The total yield of dry chilli was estimated using five picks.

RESULTS AND DISCUSSION

The thrips damage progress curves over time during *yala* 1998 and *yala* 1999 for different treatments are given in Figure 1. During *yala* 1998, incidence of thrips damage was first observed in second week of June when the crop was at 3 weeks after transplanting (WAT) while in *yala* 1999 it was in first week of July when the crop was at 5 WAT. Severity was very high in unsprayed treatment from 4 WAT in *yala* 1998. During the same season, plots treated with 6 and 8 times of chemical sprays had fairly low severity index (20-50) throughout the cropping period while the 2 and 4 times sprays had low severity only up to 6 WAT and 9 WAT respectively. The same pattern was followed in 1999. In 2 and 4 spray treatments, severity was low only up to 9 WAT. During this time crop was at its flowering and fruit forming stage. Six and 8 sprays had the severity level below 49 throughout the cropping period. According to the results of both seasons, five different severity levels were obtained at harvesting stage. These results clearly show the importance of insecticides sprays for the control of thrips damage in chilli.

(a)



(b)

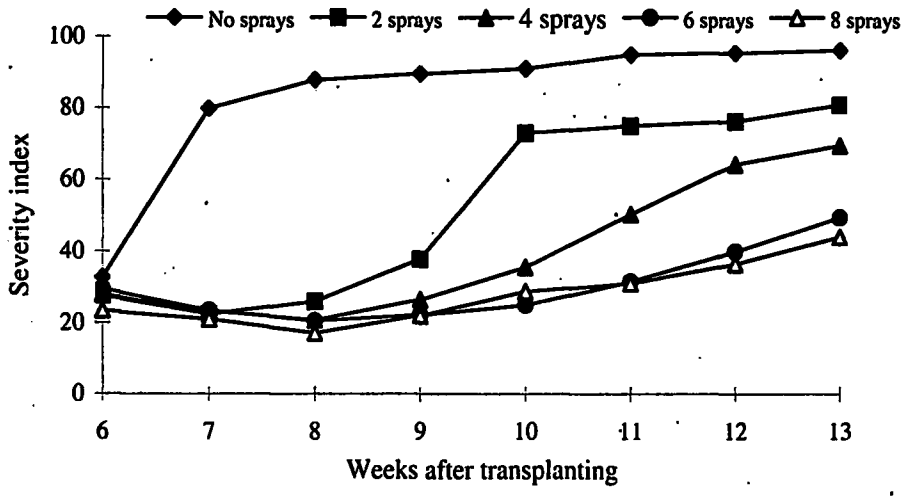


Figure 1. Change of severity of thrips damage over time under different number of sprays during *yala* 1998 (a) and *yala* 1999 (b) at Maha Illuppallama

When severity index of thrips damage was plotted against yield, a linear regression was observed with high correlation ($r = -0.92$ and $r = -0.96$) between these two factors in *yala* 1998 and *yala* 1999 respectively. The dry chilli yield was used for regression equations (Figure 2).

Yield reduction of chilli due to thrips was estimated by comparing the yields between treated and untreated plots. During both seasons plants were damaged only by thrips and there was no other insect damages observed during the experimental period. Therefore, yield reduction in chilli was attributed to thrips damage only.

According to the results in *yala* 1998, 8 times insecticides sprays had the lowest severity index of 40.27 giving dry chilli yield of 2.54 t ha^{-1}.The severity index under unsprayed condition was 96.66 and the yield was 1.19 t ha^{-1}. During this season, the average yield loss of variety *Arunalu* due to thrips was 53% (Figure 2). In 1999, the lowest severity observed was 44.1 while severity index under unsprayed conditions was 96.18. Therefore, the average yield loss of variety *Arunalu* was 54% (Figure 2). The results revealed that in the dry zone during *yala,* the yield loss in chilli due to thrips is over 53%.

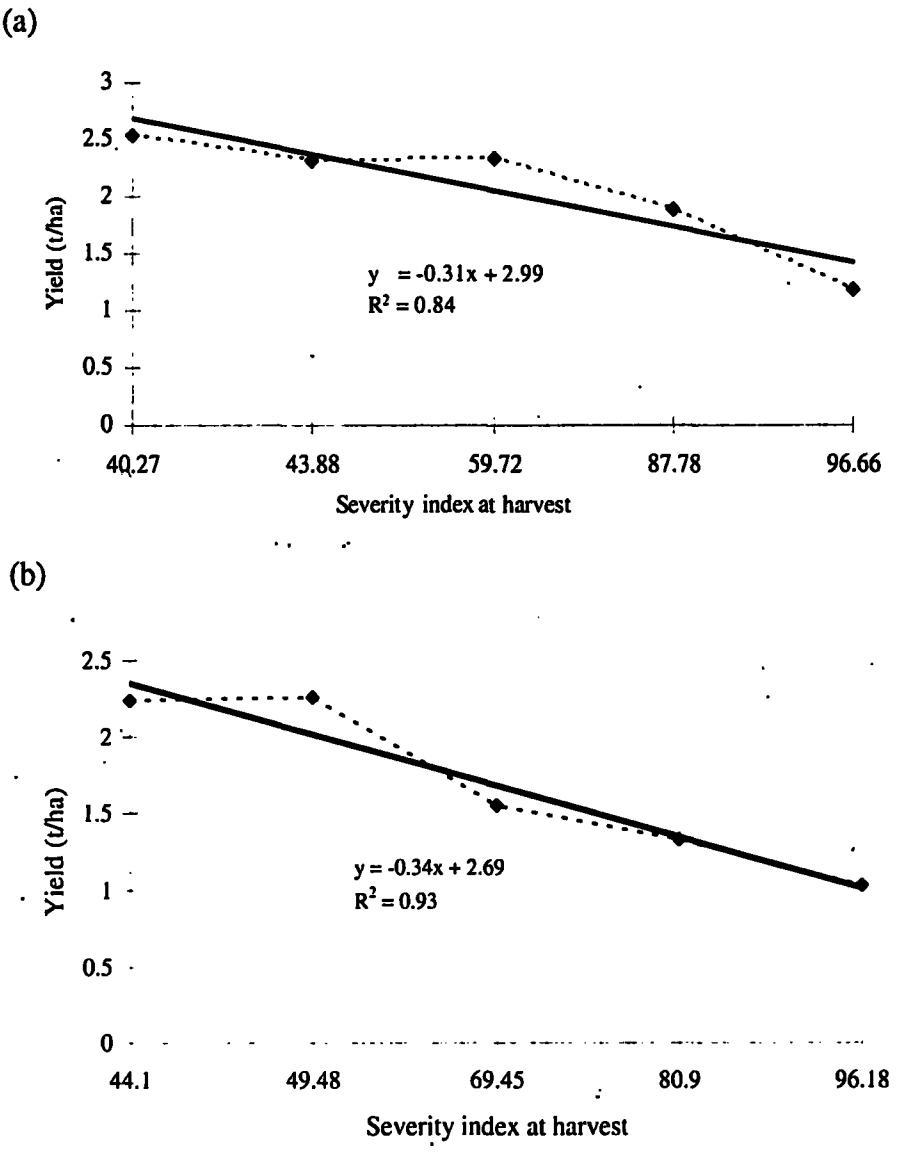


Figure 2. Yield of chilli in relation to different levels of thrips damage during *yala* 1998 (a) and *Yala* 1999 (b) at Maha- Illuppallama

CONCLUSIONS

Severity index for thrips damage in chilli was about 96 under untreated conditions during both *yala* seasons. A negative linear relationship was observed between thrips damage severity and yield. Thrips can cause significantly higher yield losses up to 53% or more under untreated conditions.

REFERENCES

Anonymous. 1963. Half Yearly Report, Regional Agricultural research Centre, Maha-Illuppallama

Bal, A.B. 1991. Action threshold for flower thrips on cowpea (*Vigna unguiculata* (L.) Walp.) in senegal. Tropical Pest Management 37: 363-367.

Central Bank. 2000. Central Bank Report-2000, Central bank of Sri Lanka. 29p.

Fernando, H.E., J.W.L. Peiris. 1957. Investigations on the chilli leaf curl complex and its control. Tropical Agriculturist CXIII: 305-323.

Fournier, F, G. Boivin and R.K. Stewart. 1995. Effect of *Thrips tabaci* (Thysanoptera: Thripidae) on yellow onion yields and threshold for its management. J. Econo. Entomol. 88: 1401-1407.

Hall, W.J. 1930. The South African citrus thrips in Southern Rhodesia. Report of Mazoe Citrus Experimental Station 1: 5-55.

Johnpulle, A.L. 1939. Chilli leaf curl experiments. Tropical Agriculturist XCII: 28-30.

Lewis, T. 1997. Pest thrips in perspective. In Thrips as Crop Pests, Eds. T. Lewis. Pp. 1-13. University Press, cambridge.

Peiris, J.W.L. 1953. Chilli leaf curl complex. Tropical Agriculturist CIX: 1-4.

Quayle, H.J. 1938. Insects of Citrus and Other Tropical Fruit.Comstock, Ithaca, New York.

Schoonhoven, A. van and J. Pena. 1976. Estimation of yield losses in cassava following attack from thrips. J. Econo. Entomol. 69: 514-516.

Wijerathna Banda, P.M. 1994. Integrated approach of the chilli insect pest management research. Krushi 14(1): 31-40.

Wijerathna Banda, P.M. 1997. IPM for small scale chilli farmers: Nature of leaf curl and its control with reduced insecticide applications. Krushi 15(2-4): 7-14.