



PERFORMANCES OF SOME WEED EXTRACTS ON PEST, YIELD AND QUALITY OF LITCHI

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ABSTRACT

This study was conducted at the Hajee Mohammad Danesh Science and Technology University Farm, Dinajpur, during August 2010 to July 2011 with aqueous and alcoholic extracts of *Solanum nigrum*, *Polygonum hydropiper*, *Convolvulus arvensis* and *Heliotropium indicum* weeds for controlling mites and fruit borer of litchi (Variety-Madraji). Percent fruit infestation by fruit borer was higher (14.33) in control and the alcoholic extract of *H. indicum* showed significantly lowest level (1.0) of fruit infestation compared to control and other treatments. Except control all other treatments were very much effective in controlling litchi mites. Among the treatments, the alcoholic extract *H. indicum* proved significant performance on yield and quality parameters i.e. number of fruit set/panicle, number of fruit/panicle at 30 days of fruit set, number of fruit/panicle at harvest, fruit length (cm), fruit diameter (cm), fresh weight of fruit (g), weight of peel (g), weight of aril (g), weight of seed (g), dry matter content of aril (%), protein content of aril (%), vitamin C content of aril (mg/100g) of litchi by protecting the infestations of mites and fruit borer. Among the different treatments alcoholic extract *H. indicum* were more effective for controlling mites and fruit borer of litchi than those of other treatments.

Key words: Litchi pests, quality, pests, weed extracts, yield

INTRODUCTION

Litchi (*Litchi chinensis*) is a delicious, juicy fruit of excellent quality (Menzel 2005). It is liked very much in many countries in the world. In Bangladesh, Dinajpur is the pioneer district of litchi production. But the litchi growers of Dinajpur are facing some serious problem regarding crop protection. Among different pests litchi mite and fruit borer are the most destructive causing serious damage to the crop (Menzel *et al.* 2005).

Mites lay eggs on young leave or buds. Egg hatch in 3-4 days and the newly emerged nymphs commence to feed immediately. The nymphs turned into adults within period of 13 days. Because of their feeding infested leaves and shoots become distorted and overgrown leaf hairs form the brown velvety crinose in which the mite continue to shelter, feed and breed (Sharma 1991). Infestation progresses through new flashes from older erinose on mature leaves. If these sequences are not broken, terminal growth stops, tree vigor decreases and the plants show reduction in photosynthesis (Waite 1986). The fruit borer cause serious damage to the fruits and deteriorate fruit quality. This insect does not feed on the edible flesh aril but attack the seed from micropilar end (Batten

and Loebel 1984). The caterpillars make hole at the stem-end of the fruit and feed on hard seed. Yeast and bacteria that are introduced into the wound on the proboscis of the moth initiate fermentation of the fruit (Sands and Schotz 1989). High humidity and frequent rainfall during fruit development increases the population of the insect. Due to attack of fruit borer the quality of fruit deteriorates drastically. The fruit becomes smaller and its market price also decreases to a great extent. Before eating, when the peel of the infested fruit is removed the caterpillars come out causing panic to the consumer. For controlling the above mentioned pests of litchi, growers spray chemical pesticides directly on the developing fruits which have long-term residual effects. Now- a-days use of organic agro-products for plant protection is increasing worldwide. In Bangladesh there are many perennial weeds having different organic compounds can prevent/control the litchi mite or fruit borer. Therefore, the present study was undertaken to evaluate the efficacy of *Solanum nigrum*, *Polygonum hydropiper*, *Convolvulus arvensis* and *Heliotropium indicum* extracts for controlling litchi mites and borer to increase the yield and quality of the fruit.

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MATERIALS AND METHODS

Fifteen to twenty years old litchi plants (variety-Madraj) and extracts from four perennial weeds (black nightshade-*Solanum nigrum*, marshpper smart weed-*Polygonum hydropiper*, field bindweed-*Convolvulus arvensis* and Indian heliotrope-*Heliotropium indicum*) were used for conducting the experiment at the Hajee Mohammad Danesh Science and Technology University Farm, Dinajpur, during August 2010 to July 2011. Every tree was considered as a unit plot. As treatments aqueous and alcoholic extracts from each of the weed was used to investigate the efficacy in controlling some major pests of litchi. Litchi trees were made ready for conducting investigation by good management practices like irrigation, fertilization etc. The field experiment was conducted on litchi trees (15-20 years old) using RCBD with three replications. There were nine treatments including control. So, 27(9×3) litchi trees were needed for conducting the study. The treatments were T₁= Control, T₂= *Solanum nigrum* extract in aqueous solution, T₃= *Solanum nigrum* extract in alcoholic solution, T₄= *Polygonum hydropiper* extract in aqueous solution, T₅= *Polygonum hydropiper* extract in alcoholic solution, T₆= *Convolvulus arvensis* extract in aqueous solution, T₇= *Convolvulus arvensis* extract in alcoholic solution, T₈= *Heliotropium indicum* extract in aqueous solution and T₉= *Heliotropium indicum* extract in alcoholic solution.

The collected data were Number of leaves/shoot infested by mite, Number of fruit set/panicle, Number fruit retention/panicle at 30 days of fruit set, number of fruit/panicle at harvest, number of fruit infested by fruit borer (%), length of fruit (cm), breath of fruit (cm), weight of fresh fruit (g), weight of peel (g), Weight of aril (g), weight of seed (without aril) (g), dry matter content of aril (%), protein content of aril (%), vitamin C content of aril (mg/100g). Protein content of aril was determined by multiplying the total nitrogen by 6.25. The total N of the oven-dried samples was determined by improved Kjeldhal method as outlined by AOAC (1966).

Vitamin C content of aril was estimated by visual titration method using metaphosphoric acid and indophenols reagent. Protein and Vitamin C content of aril were determined at Agricultural chemistry laboratory, Bangladesh Agricultural University, Mymensingh. The treatment means were compared using Duncan's Multiple Range Test (DMRT) at 5% level of significance (Gomez and Gomez 1984).

RESULTS AND DISCUSSION

Number of leaves/shoot infested by mite: Except control all other treatments were very much effective in controlling litchi mites. Sarmah *et al.* (1991) reported that field evaluation of APEs recorded 46.9 – 81.8% mite reduction at 5.0% and 64.7 – 100.0% at

10.0% concentration of plant extracts. More acaricidal activity was noticed in *Polygonum hydropiper* under field condition.

Number of fruit set/panicle: Number of fruit set/panicle was significantly influenced by the application of weed extracts. The data are presented in table 1. The highest number of fruit set/panicle (41.33) was found in the application of *Heliotropium indicum* extract in alcoholic solution which was statistically similar to the application of *Heliotropium indicum* extract in aqueous solution (37.00) and the lowest number of fruit set/panicle (24.33) was found in the control. The application of *Solanum nigrum*, *Polygonum hydropiper*, *Convolvulus arvensis* extract in aqueous and alcoholic solution was statistically similar in case of number of fruit set/panicle.

Number of fruit retention/panicle at 30 days of fruit set: Number of fruit retention/panicle at 30 days of fruit set was significantly influenced by the application of weed extracts. The data are shown in table 1. The highest number of fruit retention/panicle (35.00) at 30 days of fruit set was obtained in the application of *Heliotropium indicum* extract in alcoholic solution and the second highest data (32.33) was obtained in treatment eight (*Heliotropium indicum* extract in aqueous solution). The lowest number of fruit retention/panicle at 30 days of fruit set (19.67) was found in the control. The application of *Solanum nigrum*, *Polygonum hydropiper*, *Convolvulus arvensis* extract in aqueous and alcoholic solution was statistically similar in case of number of fruit /panicle at 30 days of fruit set.

Number of fruit/panicle at harvest: A significant variation was observed in number of fruit/panicle at harvest due to application of different weed extracts. The data are shown in Table 1. The highest number of fruit /panicle at harvest (34.33) was recorded in the application of *Heliotropium indicum* extract in alcoholic solution which was statistically similar to the application of *Heliotropium indicum* extract in aqueous solution (30.33) and the lowest number of fruit/panicle at harvest (18.33) was recorded in the control. The application of *Solanum nigrum*, *Polygonum hydropiper*, *Convolvulus arvensis* extracts in aqueous and alcoholic solution was statistically similar in case of number of fruit/panicle at harvest.

Fruit infested by fruit borer (%): A significant variation was observed in fruit infested by fruit borer by the application of various weed extracts. Figure 1 shows the result. The highest percentage of fruit infested by fruit borer (14.33%) was found in control due to not application of weed extracts and the lowest percent fruit infested by fruit borer (1%) was found in the application of *Heliotropium indicum* extract in alcoholic solution

Table 1. Effect of various weed extracts on yield contributing parameters of litchi

Treatments	No. of fruit set/ panicle	No. of fruit /panicle at 30 days of fruit set	No. of fruit/panicle at harvest	Length of fruit (cm)	Diameter of fruit (cm)	Weight of fresh fruit(g)
T ₁	24.33c	19.67d	18.33d	3.40a	3.30a	16.20a
T ₂	32.00b	29.33bc	27.00bc	3.56a	3.63a	16.86a
T ₃	29.33b	25.67c	24.67c	3.46a	3.43a	17.33a
T ₄	31.00b	28.00bc	26.67bc	3.66a	3.43a	16.93a
T ₅	30.00b	26.33c	25.00c	3.56a	3.53a	16.93a
T ₆	28.67bc	24.67c	23.67c	3.60a	3.63a	17.13a
T ₇	30.33b	26.33c	24.67c	3.60a	3.46a	16.46a
T ₈	37.00a	32.33ab	30.33ab	3.40a	3.33a	16.40a
T ₉	41.33a	35.00a	34.33a	4.13a	3.70a	17.46a
CV(%)	8.63	10.19	9.20	14.50	11.47	6.79

Mean followed by same letter(s) did not differ significantly at 5% level of significance

Table 2. Effect of various weed extracts on yield and quality attributes of litchi

Treatments	Weight of peel (g)	Weight of Aril (g)	Weight of seed (without aril) (g)	Dry matter content of aril (%)	Protein content of aril (%)	Vitamin C content of aril (mg/100g)
T ₁	2.40a	8.05b	2.40b	17.21b	0.72b	69.03b
T ₂	2.55a	8.57b	2.76ab	19.07ab	0.73b	69.12ab
T ₃	2.47a	8.77b	2.85ab	18.04b	0.73b	69.20ab
T ₄	2.53a	8.91b	2.66ab	18.17ab	0.73b	69.18ab
T ₅	2.42a	9.31ab	2.45ab	17.87b	0.73b	70.83ab
T ₆	2.50a	9.22ab	2.60ab	17.60b	0.75ab	69.58ab
T ₇	2.76a	8.71b	2.55ab	18.12b	0.75ab	70.21ab
T ₈	2.52a	8.14b	2.46ab	17.82b	0.76ab	69.61ab
T ₉	2.73a	10.06a	3.16a	20.74a	0.80a	71.39a
CV(%)	40.89	7.70	13.97	4.90	1.48	3.73

Mean followed by same letter(s) did not differ significantly at 5% level of significance

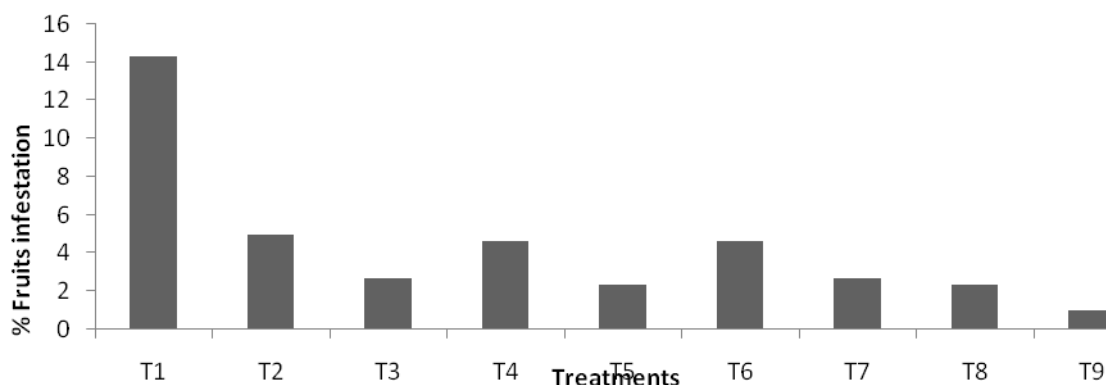


Figure 1. Fruit infested by fruit borer (%)

because the alcoholic solution of *Heliotropium indicum* was very effective to control the litchi fruit borer. Other treatments i.e. *Solanum nigrum* (5.00%), *Polygonum hydropiper* (4.67%), *Convolvulus arvensis* (4.67%), *Heliotropium indicum* (2.33%) extract in aqueous solution and *Solanum nigrum* (2.66%), *Polygonum hydropiper* (2.33%), *Convolvulus arvensis* (2.66%), *Heliotropium indicum* (2.33%) extract in alcoholic solution were statistically identical and infested percentage by fruit borer was low due to application of weed extracts in comparison with control. Hegde and Nandihalli (2009) showed that plant extracts are effective in controlling fruit borer. Dolui and Debnath (2010) were reported that the methanolic extracts of leaves of *Heliotropium indicum* exhibited significant activity at 4% concentration in controlling *Helopeltis theivora*. The numbers of spots produced were only 18.67 and 22.67 respectively, which are significantly less than the number of spots produced in control (104.00 and 93.33 respectively).

Length of fruit (cm): Length of fruit (cm) was not significantly influenced by the application of weed extracts (the data are shown in table 1). The maximum length of fruit (4.13cm) was recorded in *Heliotropium indicum* extract in alcoholic solution and minimum length of fruit (3.40cm) was recorded in control. Other treatments were statistically similar.

Diameter of fruit (cm): Diameter of fruit was not significantly influenced by the application of weed extracts (Table 1 shows the result). The maximum diameter of fruit (3.70cm) was recorded in *Heliotropium indicum* extract in alcoholic solution and minimum diameter of fruit (3.30cm) was recorded in control.

Weight of fresh fruit (g): Variation among the treatment in respect of weight of fresh fruit was not significant by the application of weed extracts. The result is presented in table 1. The maximum weight of fresh fruit (17.46g) was

recorded in *Heliotropium indicum* extract in alcoholic solution and the minimum weight of fresh fruit (16.20g) was recorded in control. The weight of 16.86g, 16.93g, 17.13g and 16.40g was recorded in *Solanum nigrum*, *Polygonum hydropiper*, *Convolvulus arvensis* and *Heliotropium indicum* extract in aqueous solution, respectively. In case of alcoholic solution, the weight 17.33g, 16.93g, 16.46g was recorded in *Solanum nigrum*, *Polygonum hydropiper* and *Convolvulus arvensis* extracts, respectively. The finding of Biswas *et al.* (2004) was in agreement to this finding.

Weight of peel (g): Weight of peel was not significantly influenced by the application of weed extracts. Table 2 shows the results. The maximum

weight of peel (2.73g) was observed in *Heliotropium indicum* extract in alcoholic solution and the minimum weight of peel (2.40g) was observed in control.

Weight of aril (g): Weight of aril was significantly influenced by the application of weed extracts which is presented in table 2. The highest weight of aril (10.06g) was obtained in the application of *Heliotropium indicum* extract in alcoholic solution, this treatment was statistically identical with *Polygonum hydropiper* extract in alcoholic solution (7.77g) and *Convolvulus arvensis* extract in aqueous solution (8.14g). *Solanum nigrum* extract in aqueous solution (8.57g) and alcoholic solution (8.77g), *Polygonum hydropiper* extract in aqueous solution (8.91g), *Convolvulus arvensis* extract in alcoholic solution (8.71g) and *Heliotropium indicum* extract in aqueous solution (8.14g) was statistically identical. The lowest weight of aril (8.05g) was obtained in control.

Weight of seed (without aril) (g): Weight of seed (without aril) was significantly influenced due to the application of weed extracts. The data are shown in table 2. The highest weight of seed (without aril) (3.16g) was found in the application of *Heliotropium indicum* extract in alcoholic solution and lowest weight of seed (without aril) (2.40g) was found control. Medium weight of seed (without aril) (2.45-2.85g) was statistically similar and found in treatments *Solanum nigrum* extract in aqueous solution, *Solanum nigrum* extract in alcoholic solution, *Polygonum hydropiper* extract in aqueous solution, *Polygonum hydropiper* extract in alcoholic solution, *Convolvulus arvensis* extract in aqueous solution, *Convolvulus arvensis* extract in alcoholic solution, *Heliotropium indicum* extract in aqueous solution

Dry matter content of aril (%): Significant variations were found in respect of dry matter content of aril, which is represented in table 2. The highest dry matter content of aril (20.74%) was obtained in the application of *Heliotropium indicum* extract in alcoholic solution and the lowest dry matter content of aril (17.21%) was obtained in the control which was similar to that *Solanum nigrum* extract in alcoholic solution (18.04%), *Polygonum hydropiper* extract in alcoholic solution (17.87%), *Convolvulus arvensis* extract in aqueous solution (17.60%), *Convolvulus arvensis* extract in alcoholic solution (18.12%) and *Heliotropium indicum* extract in aqueous solution (17.82%).

Protein content of aril (%): Significant variations were found in respect of protein content of aril. The highest protein content of aril (0.80%) was obtained in the application of *Heliotropium indicum* extract in alcoholic solution which was statistically identical with the *Convolvulus arvensis* extract in aqueous (0.75%) and alcoholic (0.75%) solution and

Convolvulus arvensis extract in alcoholic solution (0.76%) and the lowest protein content of aril (0.72%) was obtained in control. 0.73 percent protein content of aril was found in the treatment of *Solanum nigrum* extract in aqueous and alcoholic solution, *Polygonum hydropiper* extract in aqueous and alcoholic solution.

Vitamin C content of aril (mg/100g): Significant variations were found in respect of vitamin C content of aril. The highest amount vitamin C content of aril (71.91mg/100g) was obtained in the application of *Heliotropium indicum* extract in alcoholic solution and the lowest amount of vitamin C of aril (69.03mg/100g) was obtained in control.

The vitamin C content of *Solanum nigrum* extract in alcoholic solution, *Polygonum hydropiper* extract in alcoholic solution, *Convolvulus arvensis* extract in aqueous, *Convolvulus arvensis* extract in alcoholic solution, *Heliotropium indicum* extract in aqueous solution were 69.20mg/100g, 70.83mg/100g, 69.58mg/100g, 70.21mg/100g and 69.61mg/100g respectively.

CONCLUSION

Percent fruit infestation by fruit borer was higher in control and the alcoholic extract of *H. indicum* showed significantly lowest level of fruit infestation compared to control and other treatments. Except control all other treatments were very much effective in controlling litchi mites. Among the treatments, the alcoholic extract *H. indicum* proved significant performance on yield and quality parameters of litchi fruits. Among the different treatments alcoholic extract of *H. indicum* was more effective for controlling mites and fruit borer of litchi than those of other treatments.

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