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Performance of different botanical pesticides against *Thrips tabaci* L. on cauliflower

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Abstract

As experiment was carried out to find the performance of different botanical pesticides against cauliflower thrips at the field of Entomology Section, Agriculture Research Institute, Tandojam during 2019. The result of all the botanical pesticides including stock solution of Neem *(Azadirachta indica)*, Akk (*Calotropis procera* Alton), Tobacco (*Nicotiana tabacum*), Datura (*Datura stranomium*) and Trooh (*Citrullus colocynthus* Schrad. L) were highly significant in both pre-treatment and post treatment application. Further it was observed that all the botanical pesticides were highly significant in 1st application as compared to un- treated (control) which represented performance of neem extract ranged from 24 hours up to one week, by reduction percentage from 50% - 86.66% followed by trooh 43%- 80%, akk 31%- 68.88 , tobacco 18.75% -71.11% as compared to dhatoora and control. Whereas in second application there was non-significant in 24 hours (after post treatment), while after 48 hours, 96 hours and one week the treatments were found highly significant, which represented performance of stock solution increased from 48 hours up to one week, by reduction percentage of neem from 65.35%, to 85.71%, followed by Tobacco 50.00% -74.28%, trooh 53.84 -71.42, akk 42.30% -68.58%as compared to dhatooro and control respectively.

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Introduction

The Cauliflower, (*Brassica oleraceae* L. cv. Botrytis) belongs to the cabbage family and considered as delicious and important winter vegetable crops of Pakistan. It is very slight and requires more care to produce successfully than most of the other vegetables (Khoso, 1994). It is a commonly grown and widely consumed vegetable in Pakistan in particular and world in general due to their high nutritional values i.e. iron, calcium, vitamin C, starch, fibers and β-carotene (Wani, *et al.,* 2011; Uher, *et al.*, 2017). However, there are many limiting factors to low yield of cauliflower in Pakistan, with insect pests as key to lower yield and quality. The insect pests attack cauliflower from sowing till harvesting (Devjani and Singh, 2002). More than fifteen species of insect pests are reported as key pests of cauliflower with yield losses reaching up to 90% in case of severe infestation (Iqbal, *et al*., 1996; Selkar, *et al*., 2004).

Several insect pests infest cauliflower crop from sowing till harvesting causing severe yield losses. Among pests, thrips *Thrips tabaci* (Lindeman, 1889) (Thysanoptera: Thripidae) is one of the most severe and polyphagous pest that damages all stages of cauliflower. It also damages many important crops, vegetables, fruits and flowers (Mohan *et al.,* 2016). Thus, over the past two-decades, T. tabaci has become a global and major pest of onion, widely, distributed from tropical and subtropical areas into the temperate regions (Diaz-Montano *et al.,* 2011; Al-Karboli, 2014). Both, nymphs and adults of *T. tabaci* feed on young leaves using their piercing and sucking mouth parts, leaving silvery areas on leaves, flowers and fruits, with potential yield losses up to 34 to 59% (Waiganjo *et al.,* 2008; Diaz-Montano *et al.,* 2011)

Generally, growers and farm managers depend upon the synthetic pesticides for the management of insect pests of cauliflower and other crops (Mohy-ud-din *et al.*, 2009). However, indiscriminate and large scale usage of these pesticides has not only developed a resistance among insects (Elahi, *et al.,* 2019; Nagata 1982; Rahman and Debnath, 2015), pest resurgence (Reissig *et al*, 1982), but, also led to the environmental pollution along with toxicity to humans and other non-target living beings (Ayyangar and Nagasambangi, 1990; Roubos, *et al.,* 2014; Valcke, *et al.,* 2017) and toxic effect on non target organisms including natural enemies (Mahdavi, 2013; Tewari and Krishnamoorthy, 1983).

However, there are many other alternate methods available instead of synthetic chemicals that are not only target oriented but also less toxic to non-target species. These alternate methods used include cultural, mechanical, use of pathogens, organic matter and bio pesticides. Among these methods, use of bio-pesticides including botanicals are more efficient because it is safest and has no toxic effects on non-target organisms (Hashmi, 2001; Prasad and Devappa, 2006). These botanical pesticides are also useful in suppressing most noxious insect pests of vegetables (Jeyarani and Kennedy, 2004; Waghmare *et al.,* 2006; Hemchandra and Singh 2006; Shukla and Kumar, 2006; Nzanza and Mashela, 2012). These plant based substances are naturally occurring substances to control harmful insect (Bardin *et al.* 2008). These botanicals generally reduce pest attack by deterring feeding, oviposition, disgust, growth disturbance, weaken and sterility of pests (Abdalraheem and Elshafie, 2013; Schmutterer, 1990).

Neem seed extracts have, therefore, a significant potential for integrated pest control measures especially in developing but also in modern countries (Schmutterer 1988; Schmutterer, 1995). The azadirachtin substance present in Neem bitter in test which effect on growth regulator and feeding activity of insect. It provides resistance to plant and result in low population of sucking insect pests (Hameed *et al*., 2012; Islam, *et al.,* 2005). The nicotine substance found in Tobacco (*Nicotiana tabacum*) was recognized since long as the poisonous material, it is a rapid performing insecticide against insect pests (Mamun and Ahmed 2011).

Some other potential bio pesticides include stock solution from *Citrullus colocynthus* Schrad. L.) (locally named as Tumma in Punjabi and Tooh in Sindhi) which belongs to *Cucurbitaceae* family and the fruits are generally fed to animals for dowering and fruit. The stock solution of Tooh (*Citrullus colocynthus)* is also effective against various insect pests of different crops. The Akk (*Calotropisprocera alton)* plant extract helpful to suppress the insect pests on crops (Shazia Sultana *et al.,* 2006). It is the call of day to produce production without contamination of residual effect of pesticides to reduce health risks to human being by using pesticides of conventional method prepared from naturally occurring plants (Horowitiz and Ishaaya, 2004).

Therefore, this study was undertaken to evaluate the impact of various locally available plant materials against pests of cauliflower thrips.

Materials and methods

The field experiment was carried out at Entomology Section, Agriculture Research Institute Tandojam, during Rabi season 2016. The experiment replicate three time with complete randomized block Design (RCBD) with six treatments, Neem, Akk, Trooh, Tobacco, Dhatoora and control respectively.

The five plants and five leaves from each replication were selected for observation per plants *i.e;* two leaves from top portion and two from middle and one from bottom side. The pre-treatment observation was carried out before spray and post-treatment observation were made after 24 hours, 48 hours, 96 hours and One week. The mortality/reduction% age was determined through the following formula.

$$\text{Reduction\%} = \frac{\text{Control} - \text{Post Treatment Population}}{\text{Control}} \times 100$$

Preparation of botanical pesticides

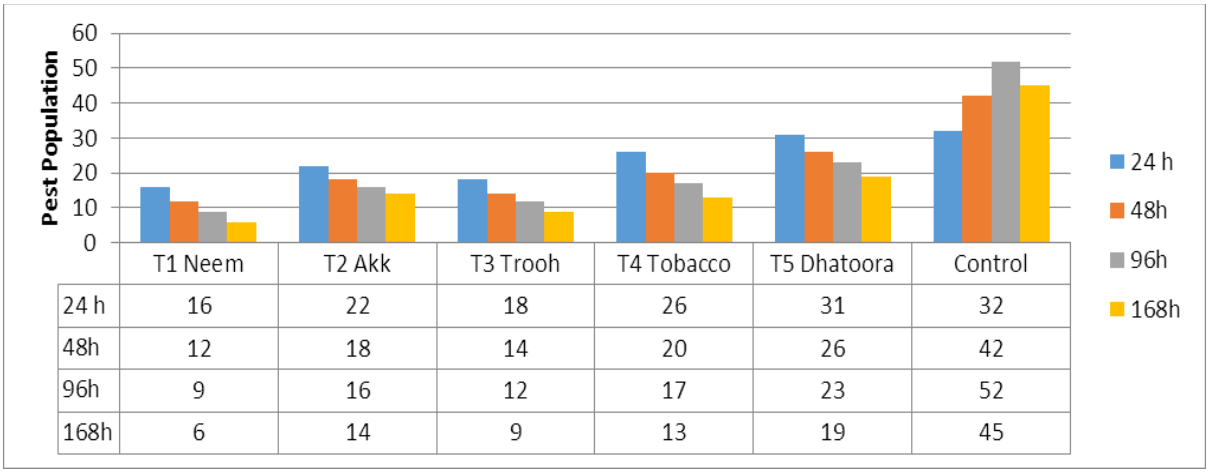
The Ten kg of each plant material were brought in Entomology Section, for preparation of stock solution. The material was grinded in small particles then boiled in water cane and mix with soap. The mixtures were sieved from muslin cloth and left them for 2 hour to become cool. This mixture of stock solution added with required water for covering the field of cauliflower.

Results

The data on 1st application of stock solution against cauliflower Thrips showed (Table: 1, Fig: 1and 2) that all botanical insecticides were highly significant at 24, 48, 96, hour and one week intervals. Among those the neem gave better performance on 24 hours up to one week, by reduction percentage from 50% to 86.66% followed by trooh 43% to 80%, akk 31% to 68.88, tobacco 18.75% to 71.11% as compared to dhatoora an control respectively.

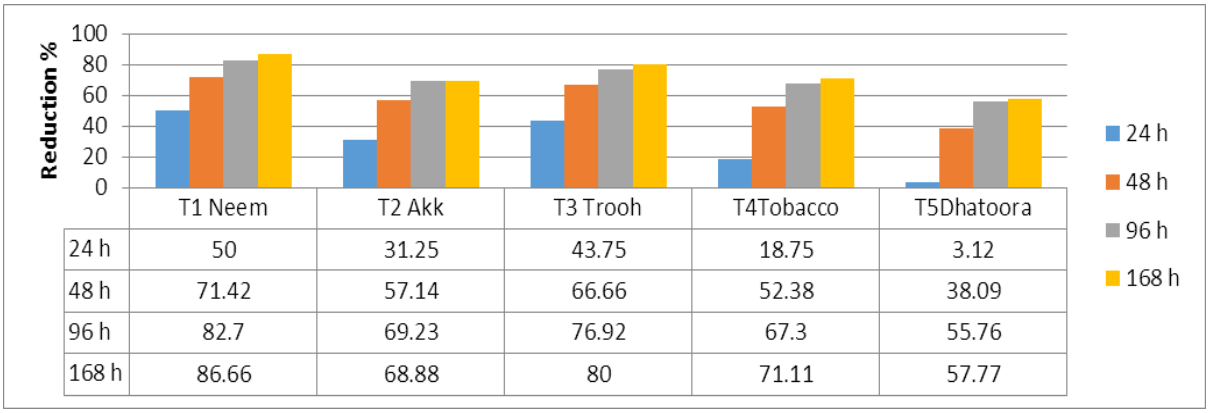
Table 1. Efficacy of different botanical insecticides against *T. tabaci* on cauliflower.

Treatments	Pre-treatment observation/ Pest population	Post treatment observation/ Pest Population				Reduction% age			
		24 h	48h	96h	168h	24 h	48 h	96 h	168h
Neem	18.00	16.00	12.00	9.00	6.00	50.00	71.42	82.70	86.66
Akk	24.00	22.00	18	16	14.0	31.25	57.14	69.23	68.88
Trooh	19.00	18.00	14	12	9.0	43.75	66.66	76.92	80.00
Tobacco	31.00	26	20	17	13.0	18.75	52.38	67.30	71.11
Dhatoora	36.00	31.00	26	23	19.0	3.12	38.09	55.76	57.77
Control	27.00	32	42	52	45.0	------	------	-----	-----
CD I (0.05)		5.356	10.25	6.89	7.270				
CD II (0.01)		7.618	14.58	9.08	10.34				



	T1 Neem	T2 Akk	T3 Trooh	T4 Tobacco	T5 Dhatoora	Control
24 h	16	22	18	26	31	32
48h	12	18	14	20	26	42
96h	9	16	12	17	23	52
168h	6	14	9	13	19	45

Fig. 1. Efficacy of different botanical insecticides against *T. tabaci* on cauliflower.



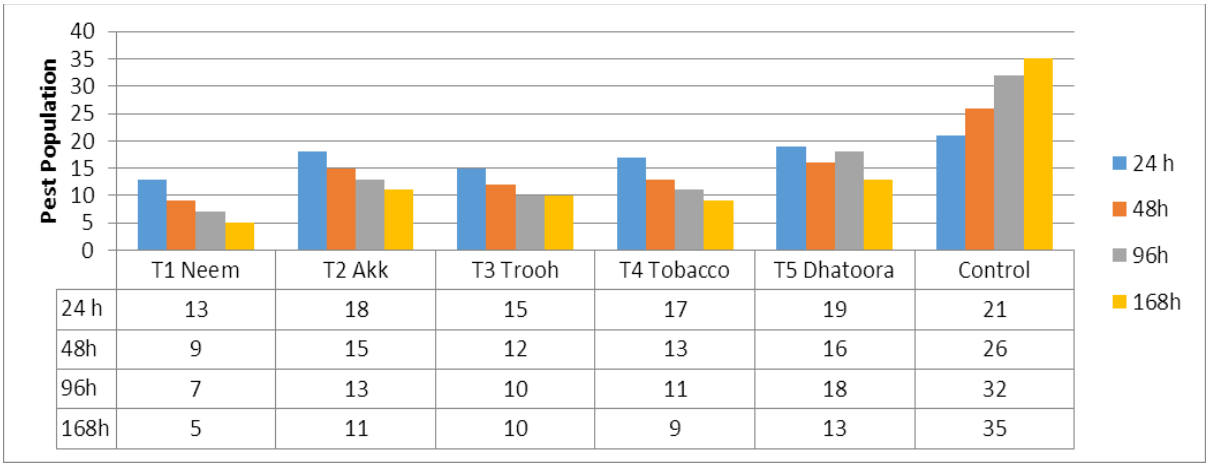
	T1 Neem	T2 Akk	T3 Trooh	T4Tobacco	T5Dhatoora
24 h	50	31.25	43.75	18.75	3.12
48 h	71.42	57.14	66.66	52.38	38.09
96 h	82.7	69.23	76.92	67.3	55.76
168 h	86.66	68.88	80	71.11	57.77

Fig. 2. Reduction percentage of different botanical insecticides against *T. tabaci* on cauliflower.

The data on 2nd application showed (Table: 2, Fig:3 and 4) that the range of mortality/reduction percentage was non-significant in 24 hours, but in 48 hours, 96 hours and one week the treatments were found highly significant. The data indicated that the efficacy/reduction percentage of stock solution had increased from 48 hours up to one week, by reduction percentage of neem from 65.35%, to 85.71%, followed by trooh 50.00% - 74.28%, Tobacco 53.84 -71.42, akk 42.30% - 68.58% as compared to dhatooro and control respectively.

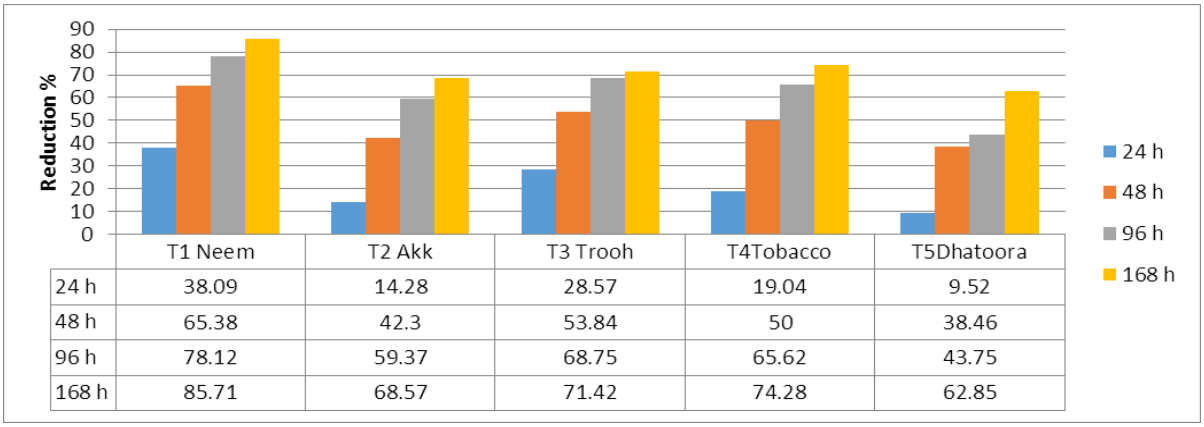
Table 2. Efficacy of different botanical insecticides against *T. tabaci* on cauliflower.

Treatments	Pre-treatment observation/ Pest population	Post treatment observation/ Pest Population				Reduction% age			
		24 h	48h	96h	168h	24 h	48 h	96 h	168h
Neem	16.00	13.00	9.00	7.00	5.00	38.09	65.38	78.12	85.71
Akk	20.00	18.00	15.00	13.00	11.00	14.28	42.30	59.37	68.57
Trooh	17.00	15.00	12.00	10.00	10.00	28.57	53.84	68.75	71.42
Tobacco	21.00	17.00	13.00	11.00	9.00	19.04	50.00	65.62	74.28
Dhatoora	26.00	19.00	16.00	18.00	13.00	9.52	38.46	43.75	62.85
Control	17.00	21.00	26.00	32.00	35.00	------	------	-----	-----
CD I (0.05)		NS	6.276	8.390	7.155				
CD II (0.01)		NS	8.927	11.93	10.18				



	T1 Neem	T2 Akk	T3 Trooh	T4 Tobacco	T5 Dhatoora	Control
24 h	13	18	15	17	19	21
48h	9	15	12	13	16	26
96h	7	13	10	11	18	32
168h	5	11	10	9	13	35

Fig. 3. Efficacy of different botanical insecticides against *T. tabaci* on cauliflower.



	T1 Neem	T2 Akk	T3 Trooh	T4Tobacco	T5Dhatoora
24 h	38.09	14.28	28.57	19.04	9.52
48 h	65.38	42.3	53.84	50	38.46
96 h	78.12	59.37	68.75	65.62	43.75
168 h	85.71	68.57	71.42	74.28	62.85

Fig. 4. Reduction percentage of different botanical insecticides against *T. tabaci* on cauliflower.

Discussion

The performance of different botanical pesticides against *thrips tabaci* on cauliflower crop conducted to determine efficacy of stock solution on different target pests to reduce the role of chemical pesticides from the vegetables. The results of the 1st application showed there were highly significant differences in all treatments at different time by reduction% of neem from 50% to 86.66% followed by trooh 43% to 80%, akk 31% to 68.88, tobacco 18.75% to 71.11% as compared to control. These results are in agreement with the neem extracts provide more effective control against cauliflower thrips compared with other stock solution, these results were correlated with previous research work which indicate stock solution were better for biological control (Nadia and Schmidt, 1992; Thakur and Gupta, 2016). The 2nd application data indicated that the efficacy/reduction percentage of stock solution had increased from 48 hours up to one week, by reduction percentage of neem from 65.35%, to 85.71%, followed by trooh 50.00% - 74.28%, Tobacco 53.84 -71.42, akk 42.30% -68.58%as compared to dhatooro and control respectively. According to results it proved that neem has more reduction percentage than other stock solution, these results are highly correlated with previous investigations that found the neem stock solution a better pesticide for controlling and preventing many insect pest (Solangi, *at el* 2014). In our studies the trooh and tobacco extracts were also found to be effective against thrips these results supported by the findings of the earlier workers (Waiganjom, *et al,* 2008), suggested that the use of tobacco extracts are useful to control for the sucking insect pests. The extract of Dhatoora (Thorn apple) could be used as an effective botanical insecticide to be included in the Integrated Pest Management Programmed for many insect pests.

Conclusions

As the *Thrips tabaci* of Cauliflower control through new invented insecticides but after some time their population increased. Now there is only solution to restrict population of pest by using the botanical pesticides. The neems were effective to control thrips on cauliflower followed by akk, Trooh and Tobacco.

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