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Comparative effect of botanical extracts and synthetic pesticides against *Dysdercus cingulatus* F. and *Amrasca biguttula* I. in Okra

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Abstract
A field experiment was conducted at research area of entomology department, University of Agriculture, Faisalabad to compare effectiveness of botanical extracts and chemical pesticides against two major pests of Okra, *Dysdercus cingulatus* F. and *Amrasca biguttula* I. The experiment consisted of 5 treatments two botanical extracts (Eucalyptus and Naas boo) in 10% concentrated solution and two synthetic chemicals (Lambda cyhalothrin and Bifenthrin) in 6% concentrated solution compared with control. Experiment was conducted in randomized complete block design (RCBD) with 3 replications. Pests data were collected at an interval of 24hrs, 3days, 7days and 11 days after application of treatments. Collected data was subjected to statistical analysis with the aid of fisher's analysis of variance (ANOVA) and means of applied treatments were compared by using least significant difference (LSD). Data analysis revealed that eucalyptus and bifenthrin controlled maximum with 65% mortality rate as compared to naas boo and lambdacyhalothrin with a 35% mortality rate. It witnessed that pest population remained under economic injury level till 11 days. It is deduced from the results that reliance on pesticides successfully can be reduced by adding botanical extracts in pest control measures.

Keywords: Okra, botanical extracts, synthetic pesticides, red cotton bug and jassid

Introduction
Okra (*Abelmoschus esculents* L.) a green vegetable have dietary importance between the vegetables which belongs to Malvaceae family. Okra is known by different names, in subcontinent it is known as "Bhendi" and mainly known as "Ladyfinger" in England (Ndunguru and Rajabu, 2004) [19]. In tropical and in subtropical regions this vegetable is grown commercially and as a garden crop (Saifullah and Rabbani, 2009) [26]. Major okra producing states regions are Turkey, India, Thailand, Japan, Iran, Bangladesh, Pakistan, Malaysia and Ethiopia (Benjawan *et al*., 2007) [6]. Pakistan is a major okra growing country with 2% input of total world production (Gulsen *et al*., 2007) [10]. There are a number of reasons which cause a reduction in okra yield such as unhealthy seeds, weeds competition and pests attack, disease infection, lack of fertilizers. From above reasons insect pests are more harmful to okra crop. Since botany of okra similar to cotton due to this overlapping growing season and both crops share common host pests. During the cropping season of okra about 72 insect pests' species were observed on okra plant. (Rahman *et al.*, 2013) [24]. Plant damaging Insect pests not only cause transmission of pathogens and also effect the plant growth (Dhaliwal *et al.*, 1981; Sheedi, 1980) [8, 28]. The damaging pest includes the chewing as well as sucking insect pests. Main sucking pests of okra crop include Thrips (*Thrips tabaci* L.), *Nezara viridula* and *Dysdercus koenigii*, whitefly (*Bemisia tabaci* G) and jassid (*Amrasca biguttula* I.). Jassid is a polyphagous pest of several crops, that's why it is known as "Devastator". Jassid suck the metabolites from leaves and other succulent parts of okra plant consequently plants show slow and stunted growth (Asi *et al*., 2008) [3]. Moreover jassid secretes sticky material on the surface of leaves which reduces the radiation use efficiency (RUE) of plants (Bhatnagar and Sharma, 1991) [7]. To possess the population of these insect pests under ETL, it is indispensable to adopt integrated pest management practices i-e., biological control, cultural practices; chemical control. Chemical control measure is considered one of the most effective and as well as least recommended method to control pests especially on edible crops. Control of insect pests by chemical control method is adopted as a last resort when all the other

techniques fail to protect the crop from pests (Bashir *et al*., 2001; Raza and Afzal, 2000) [5, 25]. But contrary to the fact that chemical method is the most damaging to the environment and residual effects 90% of our farmers community adopts this method considering it as only and foremost strategy against pests (Prayogo *et al.,* 2005) [22]. It is recommended to adopt and apply Integrated Pest Management (IPM) a technique to retain the pest population under ETL (Mohyuddin *et al*., 1997) [18]. The use of these chemicals insecticides quickly kills the pest by their fast knock down effects. Control of insect pest through chemicals is considered as an effective and cheap method, but the indiscriminate use of these synthetic chemicals creates many problems (Hassan *et al.,* 2007; Malik *et al.,* 2015) [11, 15] . Use of bio pesticides in agriculture is practiced from long time to avoid the problems related to use of insecticides (Henry *et al*., 1999; Meera *et al*., 2003) [12, 16]. Botanical extract of neem and bio control agents observed as ecofriendly for the control of okra crop pests (AL-Eryan *et al*., 2001; Panickar *et al*., 2003; Singh and Brar, 2004) [2, 21, 29]. Use of neem extract as a neem oil after application indicated non-poisonous effect and acted as a growth inhibitor, ovipositional deterrent and antifeedent against insect pests of okra and cotton (Ahmed *et al*., 1995) [1]. Neem plant organs such as (leaves, fruits, bark, roots and seeds) contain different compounds which possess toxic, repellent and antifeedent properties to control the pests (Atawodi, 2009) [4]. Antifeedent and repellency effect cause a decrease in pest population with oviposition deterrence effect (Mohanty *et al*., 1988) [17]. In order to reduce reliance merely on chemical control method it is indispensable to work out an effective combination of control measures to make integrated pest management successful.

Materials and Methods

A field experiment was performed at entomology research area University of Agriculture Faisalabad, during cropping season of okra in May; 2017. Experiment was performed in randomized complete block design (RCBD) that contain 5 treatments with 3 replications. Saabs Parii variety of okra sown in a plot by hand in the month of March. The treatments were against the jassid and red cotton bug of okra pests are given in table 1.

Table 1: Treatments of Botanical extracts and synthetic chemical insecticides with their recommended dose.

T1	Eucalyptus	10%	250ml/acre
T2	Naas Boo	10%	250ml/acre
T3	Lambda cyhalothrin 2.5% EC	6%	250ml/acre
T4	Bifenthrin 10 EC	6%	250ml/acre
T5	Control		

Preparation of Botanical plant extract

Botanical extracts of plants such as Naas boo and eucalyptus was prepared in the lab. Fresh green leaves were collected from their respective trees of eucalyptus and Naas boo. These leaves were dehydrated beneath shadow about 3 weeks. On drying, these plant leaves were crushed with the help of grinder to make powder. 100g sample of powder was taken in flask and 240ml acetone solution was added in flask to make a saturated solution. The solutions were placed on agitator for 24 hours. Data was collected at peak stage of crop at flowering and fruit stage in the month of May when pest attacks maximum. Data was taken from each plot where selected five plants and take the data of insect pests from five leaves of such plant in a manner from upper, middle and lower leaves of selected plants. Data was taken at different intervals before application about 24hrs earlier and after application at an interval of 24hrs, 3 days, 7 days and 11 days. After the completion of data were analyzed by using ANOVA Analysis of Variance with statistix 8.1 software and means test by using LSD test.

Results

The above experiment was conducted to check the relative effect of synthetic insecticides (Lambda cyhalothrin 2.5% EC and bifenthrin 10EC) and botanical extracts (Eucalyptus and Naas boo) for the control of Jassid (*Amrasca devastans*) and Red cotton bug (*Dysdercus Koengii*) pests of the okra crop by application in the month of May. Data collection was done by taking standard procedures into consideration. Data was collected before and after 24hrs of application and others at an interval of 3days, 7days, and 11 days data. This experiment was done to check the control of pest by observing the pest population after treatment by comparing with control.

Table 2a: Standard mean population data of Jassid before and after the application of botanical extracts and chemical pesticides as treatments on okra.

Treatments	Data taken before application	Data taken after 24hrs of application	Data taken after 3 days of application	Data taken after 7 days of application	Data taken after 11 days of application
T_1= Eucalyptus	23.25±3.01	12.75±2.63	17.50±0.64	20.25±0.85	27.12±1.46
T_2=Naas Boo	33.92±2.77	14.85±1.48	25.62±2.15	24.75±6.76	39.62±0.62
T_3=Lambdacyhalothrin	31.80±2.33	12.65±2.27	21.50±1.70	30.12±2.55	34.31±2.77
T_4=Bifenthrin	28.30±2.12	9.30±2.27	13.25±0.85	20.50±1.70	33.31±2.21
T_5=Control	38.58±1.89	15.05±3.01	26.62±2.13	36.31±2.77	42.50±1.70

The above table 2.a showed the standard mean values of Jassid population in okra as pre-treatment and post-treatment data after application in comparison with control. The data showed that mean standard population of jassid decline sharply after 24hrs of application in treatments of eucalyptus12.75±2.63 and bifenthrin 9.30±2.27 as compared to lambdacyhalothrin and Naas boo. As the no of days increases the mean standard population of Jassid increases. After 3 days of application the pest population increase but this population under the ETL (economic threshold level) in the treatment of eucalyptus and bifenthrin as compared to control treatment population. Lambdacyhalothrin and Naas boo showed not good results in comparison with eucalyptus and bifenthrin but showed good results in comparison with a control treatment.

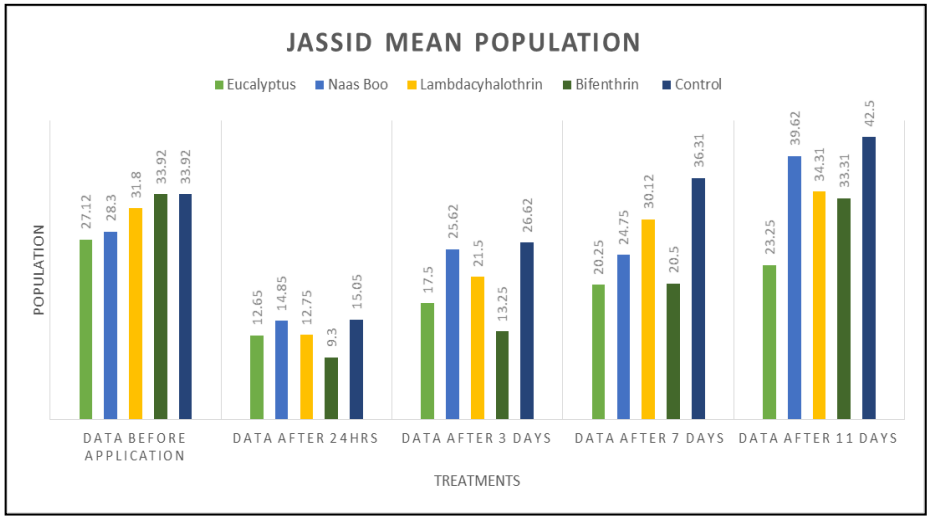

Fig 1: Mean population data of *Amrasca biguttula*

The above figure of graphical data representation of Jassid, pre-treatment and post-treatment population after application. Lambdacyhalothrin and Naas boo also have good result to control the pests in comparison with control treatment. The above data showed that pest population was in control at the interval of 24hrs, 3 days and 7 days after application because the pesticides (bifenthrin) which stop the food taking process pests from plant till 5-7 days after this its efficacy begins to decline and didn't much control the pest. Whereas the botanical extracts which have repellent effect also showed their effective control of pest till for 8-11 days after this their contents photo degrade. The above data was analyzed by using AONVA and means by LSD test.

Table 2b: Standard mean population data of red cotton bug before and after the application of botanical extracts and chemical pesticides as treatments

Treatments	Data before Application	Data after 24hrs of application	Data after 3 days of application	Data after 7 days of application	Data after 11 days of application
T_1= Eucalyptus	3.17±0.17	2.40±0.294	0.889±0.067	0.82±0. 085	1.05±0.095
T_2=Naas Boo	3.18±0.33	3.66±0.516	2.27±0. 256	1.650±0.064	2.55±0.499
T_3=Lambdacyhalothrin	2.68±0.09	1.15±0.618	1.250±0.170	2.03±0.165	2.70±0.208
T_4=Bifenthrin	3.51±0.25	0.57±0.085	0.425±0.062	1.72±0.205	2.45±0.189
T_5=Control	4.21±0.42	4.12±0.430	5.60±0.208	6.05±0.210	6.75±0.42

The above table 2.b. showed the standard mean population of Red cotton bug as pre-treatment and post-treatment data after application of botanical extracts (eucalyptus and Naas boo) and synthetic chemicals (Bifenthrin and Lambdacyhalothrin) on okra crop. Data showed that pest's population decline occurred in treatments of eucalyptus and bifenthrin. Minimum population was observed in both treatments as compared to the maximum population of control treatment. These two treatments had control the pests below their ETL (economic threshold level) as compared to Naas boo and lambdacyhalothrin till at the intervals of 24hrs, 3 days, 7 days. The collected data was analyzed by using ANOVA (analysis of variance) and P>>0.1.whereas the lambdacyhalothrin and Naas boo have also better control of pest population in comparison with control.

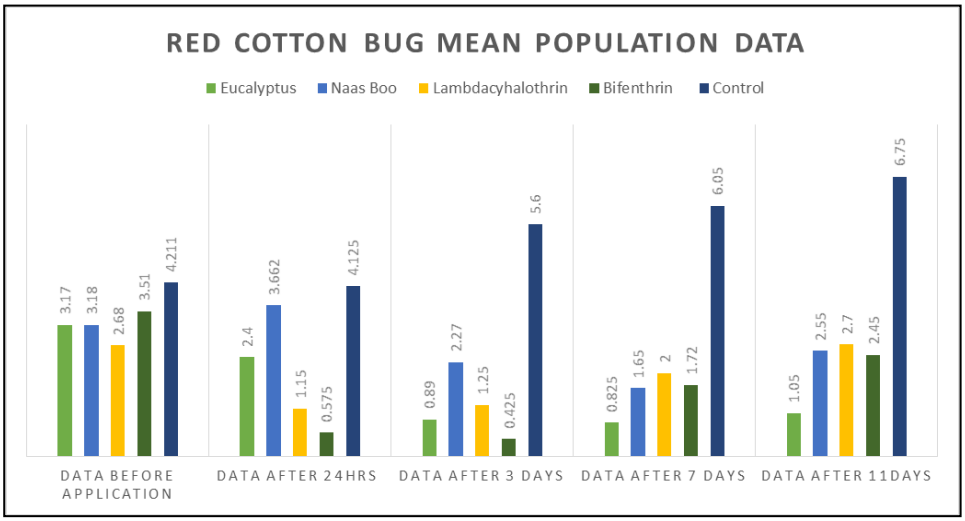

Fig 2: Mean population data of red cotton bug

The above figure showed the graphical data representation of Red cotton bug after analysis the data. This data showed that pest population was in control under ETL at an interval of 24hrs, 3days, 7 days and 11 days after application. This showed that at an interval of 24hrs, bifenthrin and eucalyptus control the pest population maximum as compared to other treatments and control treatment. Pest population remained control at an interval of 24hrs, 3 days, 7 days under ETL in treatments of eucalyptus after these intervals of time their efficiency begins to decrease to control the pest. Eucalyptus have repellent effect which control for longer time and after this their chemical contents begins to photo degrade. Data was analyzed by using LSD test on their mean values.

Discussion

This experiment was conducted to check the effective control of botanical extracts in comparison with synthetic pesticides on vegetables. Rafiq *et al*. (2014) [23] conducted an experiment on Red cotton bug in cotton field. Used the 18 different insecticides belongs to carbamate, pyrethroid, organophosphate and neonicotinoid. Among these insecticidal group pyrethroid observed effective followed by organophosphates, carbamate and neonicotinoid after 24hrs, while carbamate gave maximum control of pest followed by other groups after 72hrs. Iqbal *et al*. (2015) [13] held an experiment to control the okra pests (jassid, Thrips, whitefly) by using eight indigenous botanical extracts. It concluded that botanical extract of eucalyptus and other gave better control of pests so there is an alternate option against the insecticides to control pest by using plant extracts. After the application of plant extracts it was detected plant extracts comparatively take more days to be effective for sucking insect pests. Though, earlier studies recognized that action of synthetic insecticides were more quick to control the pests as compared to botanicals but they have antagonistic effect against bio-control agents (Oladimeji and Kannike, 2010; Saradamma, 1989; Ursani *et al*., 2014) [20, 27, 30] stated that *D. cingulatus* Fabr. Can be competently control by using synthetic chemical insecticides. Greene *et al*. (2006) [9] stated that pyrethroids, bifenthrin, lambda-cyhalothrin, cyfluthrin, deltamethrin, tralomethrin, cypermethrin are best selection to control the red cotton bug whereas organophosphate group is most effective to control the bug. Lee *et al.*, (2000) [14] conducted experimental studies on the efficacy of diverse plant extracts, show that all botanical products were effective to control the red cotton bug and mealy bug. A diversity of plant species contain chemical substances which include alkaloids, Phenolic and Terpenoids that contribute in the protection of plants.

During all over of this experiment it concluded that efficacy of botanical extracts begins to decline with the increase of days after application, which was because of photo degradation of the chemical composition in plant extracts, the days increase Throughout the period of this study, the effectiveness of the plant extracts because they are biodegradable. It is declared that plant extracts that are used to control the pest are safe to the environment and beneficial insects.

Conclusion

The conclusion of this experiment came out that botanical extracts can be used as an alternate source of synthetic insecticides for better control of jassid and red cotton bug on okra. These plant extracts do not have any adverse effect on human beings and beneficial insects. Eucalyptus and bifenthrin gave better control of jassid and red cotton bug as compared to lambdacyhalothrin and Naas boo because they have chemical toxic and repellent effect against pest for better and longtime control.

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