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RESEARCH PAPER

Botanical Modulation of Pest Pressure and Host Response in Brinjal Using *Solanum surattense* Leaf Extract

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Abstract

The present study was carried out to examine the effect of leaf extract on pest response in brinjal (*Solanum melongena L.*). Fresh leaves of Choti Kateri *(Solanum surattense*) were collected from nearby roadside areas and cleaned properly before use. The collected leaves were dried and treated to ethanol extraction using a Soxhlet apparatus. The prepared extract was applied in three different concentrations, 5 mL, 10 mL and 15 mL, along with an untreated control. Each treatment was maintained with five replications to obtain consistent results. Pest response was observed at regular intervals after the application of the extract. The recorded data were statistically analysed using one-way ANOVA. The results indicated that pest response differed according to the concentration of the extract and also varied with time after treatment.Among the tested concentrations, the 15 mL at 72hr of mean 2.4(1.69) extract showed a better and more consistent effect, especially between 48 and 72 hours after application. The lower concentrations showed only a mild and short-term response. No response was recorded in the control treatment. The results indicate that leaf extract of *Solanum surattense* shows good potential as a natural agent for decreasing pest activity in brinjal.

KEYWORDS:

Brinjal; *Solanum melongena*; Choti Kateri; *Solanum surattense;* botanical extract; pest management; ethanol extraction; eco-friendly control

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Introduction

Brinjal (*Solanum melongena L.*) is one of the most broadly grown vegetable crops in India and is also commonly consumed in daily diets due to its low value and easy availability. The crop is cultivated almost throughout then every year; however, its production is also often affected by the attack of insect pests. These pests damage different parts of the plant such as leaves, shoots, and fruits, which ultimately leads to poor yield and reduced market value. In order to control pest infestation, farmers generally depend on chemical pesticides because of their quick and visible results. Although chemical pesticides are effective in pest control, their repeated and excessive use has created several serious problems. With time, insects generate resistance against commonly used chemicals, so doing pest control more difficult. Moreover, pesticide residues on vegetables increase concerns related to human health and diseases, while their continuous uses negatively affect soil quality and make it less fertile, the environment, and beneficial insects. Because of these issues, there is increasing pressure to find safer and more sustainable methods for pest management in vegetable crops. In recent years, attention has gradually shifted towards the use of medicinal plants for pest control. Many plants used in traditional medicine are known to possess natural compounds that influence insect behaviour and survival. Instead of killing insects instantly, such plant-based products often reduce feeding activity, disturb normal growth, or weaken the pest population over time. Since these materials are of natural origin and decompose easily, they

are generally considered safer when compared to synthetic pesticides(Patil &Lingappa, 2001; Dhaliwal et al., 2010).

Choti Kateri (*Solanum surattense Burm. f.*) is a commonly also available as medicinal plant that has been traditionally used for various therapeutic purposes in traditional medicine. The plant has several secondary metabolites as well as including alkaloids and phenolic substances, which are known to have exhibit biological activity. These compounds may also aid to pest suppression by affecting insect feeding or its movement. However, very less scientific studies have analysed the role of *Solanum surattense* as a botanical extract for pest management in brinjal crops. Information related to suitable concentrations and the time-dependent response of pests after application is still insufficient. Keeping these points in view, the present study was carried out to evaluate the effect of different concentrations of *Solanum surattense* leaf extract on pest pressure and host response in brinjal. The study attempts to explore the potential of Choti Kateri as a natural and eco-friendly alternative for managing insect pests in brinjal cultivation(Schmutterer, 1990;Kamboj & Saluja, 2011).

2. Materials and Methods

The present experiment was carried out in the laboratory of the Department of Zoology, P.P.N. P.G. College, Kanpur. All experimental work and observations were conducted under laboratory conditions.Fresh healthy leaves of Choti Kateri (*Solanum surattense Burm. f.*) were manually collected from roadside sites of the Kanpur district. The collected leaves were brought to the laboratory and washed thoroughly with tap water and also by distilled water to remove dust and surface impurities. The leaves were then shade-dried at room temperature until completely dry. Healthy brinjal plants (*Solanum melongena L.*) of uniform size and growth stage were collected from Chandra Shekhar Azad University of Agriculture and Technology (CSA), Kanpur, and used for the experiment.The shade-dried leaves at room temperature of *Solanum surattense* were crushed into fine powder using a mortar and pestle procedure. The powdered material was subjected to extraction using ethanol as a solvent in a Soxhlet apparatus method. The extraction process was continued until the solvent in the siphon tube became properly colourless, indicating complete extraction of the plant material. Now after extraction, the ethanol extract was concentrated by evaporating the solvent at room temperature. The concentrated extract was stored in a clean clear container in fixed proportion and used for further experimental work. Required concentrations of the extract were prepared by diluting the stock solution with distilled water.Three different concentrations of *S. surattense* leaf extract, namely 5 mL, 10 mL, and 15 mL, were used in the experiment. An untreated control was maintained without application of the extract. The experiment was arranged in a completely randomized design with five replications for each treatment. The prepared extract solutions were applied uniformly to the brinjal plants using a hand sprayer in all treatments. Control plants were sprayed with distilled water only.After Soxhlet extraction, the ethanol was allowed to evaporate completely and the concentrated extract was taken as stock solution. Then needed working concentrations were prepared by diluting the stock extract with distilled water. For the 5 mL treatment, 5 mL of stock extract was mixed with 95 mL of distilled water to obtain a final volume of 100 mL. Again same, 10 mL and 15 mL treatments were prepared by mixing 10 mL and 15 mL of stock extract with 90 mL and 85 mL of distilled water, respectively. Distilled water alone was used for the control treatment. Observations were recorded at different time intervals after treatment.The effect of different concentrations of *Solanum surattense* leaf extract on pest response was recorded at regular intervals in between 24hr-112hr. Observations were carefully noted and mean values were calculated for each treatment based on the replications.The data obtained from the experiment were analysed using one-way analysis of variance (ANOVA) to test the significance of differences among treatments. The level of significance was tested at 5 per cent probability. Standard error (SE) and critical difference (CD) values were calculated wherever required(Dubey et al., 2011) (Koul et al., 2008).

3. Results and Discussion

Table 1:Effect of *Solanum surattense* leaf extract on pest response in brinjal at different time intervals

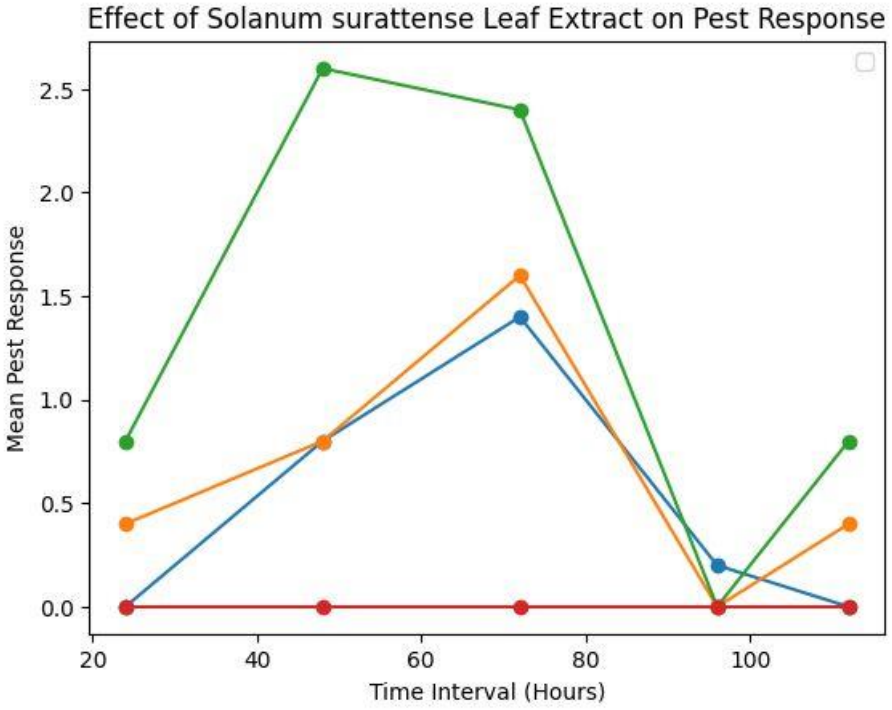
The effect of different concentrations of Choti Kateri (*Solanum surattense)* leaf extract on pest response in brinjal was recorded and calculated at various time intervals and is shown in Table 1. The results showed clear variation in pest response with respect to extract concentration as well as time after application, indicating a dose- and time-dependent effect (Isman, 2006; Dubey et al., 2011).

Treatments	No. of observations	24HR	48HR	72HR	96HR	112HR
5mL	**30**	0 (0.70)	0.8 (1.12)	1.4 (1.36)	0.2 (0.81)	0 (0.70)
10mL	**30**	0.4 (0.91)	0.8 (1.12)	1.6 (1.43)	0 (0.70)	0.4 (0.91)
15mL	**30**	0.8 (1.12)	2.6 (1.75)	2.4 (1.69)	0 (0.70)	0.8 (1.12)
Control	**30**	0	0	0	0	0

		(0.70)	(0.70)	(0.70)	(0.70)	(0.70)
S.E.	**30**	0.081	0.081	0.071	0.05	0.08
C.D ± 5%	**30**	0.175	0.174	0.512	0.11	0.17

Figures in parentheses are transformed values.
*S.E. - Standard Error
*C.D. - Critical Difference

At the 5 mL concentration, no effect was observed at 24 hours after treatment. A slight response was recorded at 48 hours of mean 0.8(1.12), which increased marginally at 72 hours of mean 1.4(1.36). However, this effect did not persist for a longer period, and very little and no response was observed at 96 and 112 hours of 0.2(0.81). This finding indicates that the lowest dose of the extract could not maintain effective pest control throughout the experimental period. The decline in efficacy at later intervals may be related to the quicker breakdown of active compounds when applied at lower doses (Kumar et al., 2011; Rajashekar et al., 2012).



The 10 mL concentration significantly give a better response as compared to the lower dose. A low effect of 0.4(0.91) was observed at 24 hours, which increased at 48 hours with 0.8(1.12) and reached a higher level at 72 hours. No response was recorded at 96 hours of 10mL, followed by a slight response at 112 hours of 0.4(0.91). This indicates that the moderate concentration was more effective for a short duration but was unable to givea good sustained control. Also, there are similar observations have been seen in studies using plant extracts, where moderate doses show temporary effects on pest activity (Kumar et al., 2011; Rajashekar et al., 2012).

The 15 mL concentration was found to be the most effective treatment. Pest response 0.8(1.12) was observed as early as 24 hours after application and increased 2.6(1.75) considerably at 48 hours. A high response of 2.4(1.69) was also maintained and showed at 72 hours. No response was observed at 96 hours of experiment, followed by a slight response at 112 hours. The higher efficacy observedat this concentration may be due to the presence of sufficient bioactive compounds, which likely mediate with insect feeding and normal activity. The reduction in response during later intervalsmay be becauseof the gradual breakdown of active substances under laboratory conditions(Senthil-Nathan, 2013; Pavela, 2016).

A clear difference was observed between the treated and untreated plants. The treated plants showed reduced pest activity, indicating the effectiveness of *Solanum surattense* leaf extract in managing mealybug infestation. indicating that the effects observed in treated plants were due to the application of *Solanum surattense* leaf extract and not a result of natural variation (Singh et al., 2006; Regnault-Roger et al., 2012).

Overall, the results shows that *S. surattense* leaf extract has the good potential to reduce pest activity in brinjal, with the 15 mL concentration showing the highest efficacy, particularly during the 48 to 72 hours period after treatment (Ahmed et al., 1984;

Saxena, 1989). This result support the possible use of Choti Kateri as a natural and eco-friendly option for pest management in brinjal cultivation. The variation in pest response observed in the present study agrees with earlier findings where botanical extracts showed concentration- and host-dependent effects(Gupta et al., 2026) (Isman, 2006; Dubey et al., 2011).

4. Conclusion

The results showing of the present study that the leaf extract of *Solanum surattense* by Soxhlet method had a good effect on pest activity in brinjal. Pest mealybug response was found to change with both the concentration of the extract at 5mL, 10mL, 15mL and the time after application. In this the different treatments of experiments, the 15 mL concentration gave better results than the lower doses, especially between 48 and 72 hours after treatment. The lower concentrations showed only a short-term and less consistent effect, suggesting that a sufficient dose is required for effective pest control. No response was recorded in the control plants, which confirms that the reduction in pest activity was due to the application of *Solanum surattense* leaf extract. On the basis on these observations, Choti Kateri appears affordable, economical and eco-friendly option for management in brinjal crop cultivation.However, further field-level studies are required to validate these findings and to establish appropriate application methods.

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