

Research Article

Juvenoid Activity of *Eupatorium cannabinum* Extract on Red Cotton Bug (*Dysdercus cingulatus*)

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ABSTRACT

Cotton has the greatest insect predation problem. In India, to protect the cotton crop from insect attack, huge amount of pesticides are applied to the cotton fields in recent years as a consequence of extensive use of synthetic pesticides have emerged lot of problem such as pest resistance to the insecticides as well as human health hazards. The development of resistance to existing conventional synthetic pesticides and the increasing public concern over environmental pollution and health hazards created by synthetic pesticides, generate a great need for new types of pest management agent's advantage with higher activity against the target pests, and lower impact on humans and environmental quality. The extract of *Eupatorium cannabinum* was applied for juvenoid activity of *Dysdercus cingulatus*. The maximum activity index (0.675) was found at 3% concentration of the fraction. Maximum numbers were found in category 4 showing one extra moult at nymphal stage which is termed as 6th instar nymph or supernymphs.

Keywords: Cotton, pesticides, *Eupatorium cannabinum*, juvenoid and *Dysdercus cingulatus*.

INTRODUCTION

Plants have been the basis of many traditional medicines throughout the world for thousands of years and continue to provide new remedies to mankind. Plants have been one of the important sources of medicines since the beginning of human civilization. The recent resurgence of plant remedies resulted from several factors, such as effectiveness of plant medicines and lesser side effects compared with modern medicines. Indigenous herbs are used as remedies against various diseases in the traditional system of medicine or in ethno medical practices. For the past few decades, compounds from natural sources have been gaining importance because of the vast chemical diversity they offer. This has led to a phenomenal increase in the demand for herbal medicine in the last 2 decades. They are relatively safe, easily available, and affordable to the masses. These drugs have given important lead in drug research, resulting in the discovery of novel molecules.

The cotton stainer *Dysdercus cingulatus* (Fab.), commonly known as red cotton bug causes serious damage by feeding on developing bolls and ripe cotton seeds (Natarajan and Rajendren, 2005). It is distributed all over the cotton producing regions of India (Sahayaraj and Illayaraja, 2008). Cotton has the greatest insect predation problem. In India, to protect the cotton crop from insect attack, huge amount of

pesticides are applied to the cotton fields in recent years as a consequence of extensive use of synthetic pesticides have emerged lot of problem such as pest resistance to the insecticides as well as human health hazards. In India, cotton production is about 295 million bales (\approx 480 lb bales) during 2009-2010 against 113.9 million bales in the rest of the world. India also has the largest area under cotton cultivation (10.31 million ha), and yield was 486 kg ha⁻¹ during 2009-2010 (Cotcorp, 2011).

There are problems of pesticide resistance and negative effects on non-target organisms including man and the environment (Rembold, 1984 and Dorow and Rembold, 1993). In India, to protect the crop from insect attack, huge amount of pesticides (54% of the total pesticides consumed in India) are applied to the cotton fields. In recent years, as a consequence of extensive use of synthetic pesticides in controlling the most damaging lepidopteran pest, the cotton boll worm (I), other pests, namely, aphids, whiteflies, mealybugs and mites have emerged in a major way.

MATERIALS AND METHODS

Plant material of *Eupatorium cannabinum* of family Compositae was collected from the local gardens. The plants was identified and authenticated by the taxonomist of botany department of S.S.L. Jain College Vidisha. A

voucher specimen of the plant material was procured in the herbarium data sheet of the laboratory. The plant material was washed thoroughly with water and then air dried in shade at room temperature $25 \pm 2^\circ\text{C}$ for more than 15 days. The air dried plant material was grinded to powder about 40 – 60 mesh size. The 50gm of the powdered material was loaded into soxhlet apparatus separately for extraction with the solvent of increasing order of polarity (n-Hexane, Chloroform and Methanol). The extract was filtered through Whatman's filter paper. Then the crude extract was concentrated in the vacuum rotary evaporator. The crude extract obtained from plants was tested for various biological activities against *Dysdercus cingulatus*.

Thin layer Chromatography

For the thin-layer chromatography (TLC), sample from the column chromatographic elute was dissolved in alcohol and spotted on to TLC plates produced from (Silica Gel No.60 F254) by means of a micropipette. The plates were placed and allowed to run in pre-saturated glass tank containing Chloroform: Methanol: Water (6:4:1). This solvent was chosen for its better resolution of maximum number of constituents with clear separation. The plates were then air dried and examined under UV light of wavelength 256nm and 360nm. Fluorescent spots were en-circled with

a pencil. The plates were subsequently sprayed with freshly prepared Dragendroffs reagent and heated for 10 minute at 110°C to facilitate the development of colored spots. The position of the spots on the TLC plates were noted by calculating the retention factor (Rf), the distance of components traveled divided by the distance, solvent traveled from the base, as below;

$$Rf = \frac{\text{Distance travelled by the solute}}{\text{Distance travelled by the solvents}}$$

OBSERVATIONS AND RESULTS

Juvenomimetic effect of purified fractions of eupatorium cannabinum on dysdercus cingulatus

Plant purified compounds showed several juvenomimetic effects to the treated nymphs of *Dysdercus cingulatus*. For scoring different categories, i.e., 0.4 formulas of Williams and Slama (1966) were used. The results obtained for fractions have been tabulated in table below.

Table reports shows that the juvenoid activity of fractions of *Eupatorium cannabinum*. The maximum activity index (0.675) was found at 3% concentration of the fraction. Maximum numbers were found in category 4 showing one extra moult at nymphal stage which is termed as 6th instar nymph or supernymphs.

Juvenoid activity of fractions of *Eupatorium cannabinum* on *Dysdercus cingulatus*

| Extract fraction | Conc. Of extract % | No. of nymphs tested | Dose μl | No. of nymphs died upon treatment | Mortality % | JH scoring | | | | | Activity index |
|------------------|--------------------|----------------------|--------------------|-----------------------------------|-------------|------------|---|---|---|---|----------------|
| | | | | | | 0 | 1 | 2 | 3 | 4 | |
| Crude | 1 | 15 | 0.5 | 1 | 7 | 3 | 3 | 4 | 3 | 1 | 0.428 |
| Crude | 2 | 15 | 0.5 | 3 | 20 | 0 | 1 | 3 | 3 | 4 | 0.666 |
| Fraction | 3 | 15 | 0.5 | 5 | 20 | 3 | 2 | 0 | 3 | 4 | 0.675 |
| Control | | 15 | 0.5 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0.000 |

15 second instar nymphs were taken in three replicates

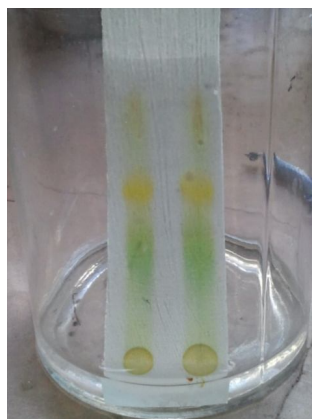
Thin Layer Chromatography

During TLC the solvents methanol, chloroform and water were used and 2 spots were seen when the Chloroform: Methanol (12:01) solvent systems were used and the RF value of spot 1 was 0.07 and of spot 2 was 0.95 but

when the Chloroform: Methanol: Water (10:02:01) solvent system was used, three spots were seen. Their Rf value were given in Table below.

Thin Layer Chromatography of plant extracts

| Plant extracts | Solvents systems used | Obtained Spots | Color characteristics | | | Rf value |
|------------------------------|--|----------------|-----------------------|-----------------|----------------|----------|
| | | | Visual | Iodine | Uv light | |
| <i>Eupatorium cannabinum</i> | Chloroform: Methanol (12:01) | Spot -1 | Yellow | Brown | Blackish brown | 0.07 |
| | | Spot -2 | Brown | Dark brown | Blackish brown | 0.95 |
| | Chloroform :Methanol: water (10:02:01) | Spot -1 | Dark green | Brownish Yellow | Light brown | 0.06 |
| | | Spot -2 | Greenish yellow | Yellow | Blackish Brown | 0.40 |
| | | Spot -3 | Greenish yellow | Yellow | Blackish Brown | 0.63 |



TLC



RED COTTON BUG

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