Evalution Of Insecticidal Activity Of *Cassia Tora* L.(Leaves) Tablet Against *Tribolium Castaneum* Context With Preservation Of Brown Rice.

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Article History: Reccieved:10/07/23 Revised: 15/07/23 Accepted: 18/07/23

ABSTRACT

Evalute insecticidal activities of dried *Cassia tora* L. leaves against Red flour beetle (*Tribolium castaneum*) Pests in comparison with different concentration in form of tablet and a conventional grain storage insecticide. An experiment was conducted to evaluate the efficacy of herbal tablets (1 g each) against red flour beetle, *Tribolium castaneum* in brown rice. Herbal tablets with different concentration *i.e.*, 5gm,10gm and15gm were kept and evaluated along with Parad tablets and compared with untreated control. Observations on progeny buildup *i.e.*, number of adults emerged at 40, 80 and 120 days after release of insects were taken and total number was worked out. Finally, the % weight loss and number of dead insects was also calculated. The number of adult insects emerged during 120 days of storage from Prada tablet treatment was very negligible and recorded only 1.33 adults, while the15gm of Cassia tora tablet treatment recorded 15 adults and the untreated control recorded 140.33adults. Consequently, there was 0.11gm weight loss of grain in Parad tablet treatment while in the other treatments the weight loss varied between 1.96gm in untreated and 0.18gm in the treatment of 15gm of Cassia tora tablet. At the doses tested the herbal tablets suppress the progeny buildup of red flour beetle. All concentration of Cassia tora tablet evaluated here were seen to have significant insecticidal properties and no adverse effects . Therefore, be used as cost effective and environmentally friendly products for controlling red flour beetles pests during storage of brown rice trial in this study.

Key words: Brown rice, Herbal tablets, *Tribolium castaneum*, Insecticidal.

DOI:10.48047/ecb/2023.12.si12.036

INTRODUCTION

Rice is a healthy, nutrient-dense grain that's an excellent source of carbohydrate, which is one of the three major macronutrients we need to consume daily. So Rice is also the staple food for several of the Indians through which the required calories are obtained for their daily living. In our country with the increase in the number of diabetes patients and awareness on nutritional benefits of brown rice, people's preferred brown rice in their diet. Red flour beetle, *Tribolium castaneum* (Herbst) is the most common and important cosmopolitan pest associated with a variety of processed grain products, including some whole grains such as brown rice[1], causing considerable damage and loss. In grains both adults and grubs cause damage. The infestation of these products results in an unpleasant smell due to thesecretion of benzoquinones from abdominal glands of beetles[2] mentioned rice bran as a source of nutrients, proteins, dietary fiber, antioxidants, oils, and sterols, among other compounds, while Frank *et al*. [3] observed faster development of *T. castaneum* on bran compared to other diets. Due to presence of nutritious bran layer, brown rice becomes highly susceptible to red flour beetle and soon develops rancidity .[4]

Though chemical insecticides or fumigants are most relied for storage insect pest management, due to some known hazards associated with them, they are to be discouraged at least in domestic grain preservation. For domestic grain preservation Mercury based ayurvedic tablets like Parad are widely being used, but there are apprehensions regarding the accidental consumption of which may be poisonous. That's why necessitates the search for safe alternatives. Herbal powders, extracts and essential oils of certain plants such as *Artemisia annua* L., *Piper nigrum* L., *Vitex negundo* L., *Syzygium aromaticum* (L.) and *Acorus calamus* L. *etc*, have been reported for their insecticidal potential against different stored products.[5]

I these many herb Chakramarda (*Cassia tora* L.) has Insecticidal activity[6]. It is also having hepatoprotective, antigenotoxic, antipsoriatic, antinociceptive immunostimulatory, anticancerous, antifeedant, larvicidal, antiproliferative, hypolipidemic, antimutagenic activity[7]. *Cassia tora* L. has contain following chemical constituents - Anthraquniones ,Phenolic compound, Phytosteroles ,Glycosides ,Tannins ,Flavonoids Amino acid ,Steroids ,Saponin ,Tannins,Cardiac glycoside and fats.

In most cases, it is difficult to remove plant powders when mixed with the grain and often interfere with the original flavour and taste. Hence, development and use of botanical tablets which can repel insects are safe alternative to insecticides and hazardous. So I this study To evaluate the efficacy of *Chakramarda (Cassia tora* L.) in context with preservation of brown rice (*Oryza sativa* L.)

Materials and Methods

Rearing and maintenance of culture

The nucleus culture of the test insect was obtained from storage laboratory, Department of Entomology and Agricultural Zoology, Parul University, Vadodara.

The culture of *Tribolium castaneum* was maintained on brown rice at room temperature in the Bio-agent laboratory. Brown rice obtained from local market at Vadodara. To eliminate any hidden infestation, It was cleaned, washed, dried and then sterilized at temperature of 50ºC overnight. From a single pair the nucleus culture of *Tribolium castaneum* was start and was multiplied in rearing jars (25cm × 15 cm × 10cm) by releasing10 pairs of one day old adults

in each glass jar containing 500g seeds for oviposition. After 48 h adults were removed from the jars and discarded. The jars were covered with muslin cloth and tied up with rubber bands.

These jars were kept in the laboratory at ambient condition. In order to get a continuous fresh supply of adults of *Tribolium castaneum* for experimentation dated culture was maintained at regular time intervals using the above rearing technique. Camel hair brush, a pair of forceps and aspirator was invariably used for transferring insects in seeds, during experimentation. Care was taken not to touch the seeds and test insects by hand.

Efficacy of botanical

With a view to determine Evalution of Insecticidal activity of *cassia tora* L.(leaves) Tablet against *Tribolium castaneum* context with preservation of Brown rice, cylindrical glass jars of 1kg capacity covered with muslin cloth were used for keeping the treated seed samples. These jars were labeled as per the treatment and replication. Each treatment was mixed with 500g Brown rice seeds and replicated thrice. Five pairs of freshly emerged (0-24 hours old) red flour beetles were released in each replicate.

Chakramarda (Cassia tora L.) powders were prepared using a pelletizer in which the powdered material was Placed in the well provided on the platform and compressed by tightening the plunger to form a disc Shaped tablet[8]. A binding material Gum acacia at 1% was used. 1gmof tablet were prepared in Quality Control Lab of Parul institute of Ayurveda, Parul university We have to use 5gm,10gm and 15gm of concentration of Chakramarda tablet in respectively Group B1,Group B2 and Group B3.Group A is untreated . Parad tablets supplied by M/s Zandu pharmacy, India were purchased in the local stores and kept in Group C. Brown rice was obtained by milling the aged and disinfested paddy grain of Freshly milled brown rice (500 g) taken in each glass container and a Chakramarda tablet as per the treatment was kept over the surface of the grain. After releasing 30 unsexed adults put into each container and they were closed. Thus, there were four treatments groups and including an untreated control with three replications arranged.

OBSERVATION

- Effect of the herbal tablet on adult emergence and mortality: The numbers of dead and living insects were

Recorded on 40th day,80th day and 120th day after the introduction of the treatment materials[9]. Both the living and

Dead insects were discarded after each recordings.

- Weight loss

The weight of seeds were taken separately, after removing the beetles from each jar on a single pan electric balance for each replicate after 40th day,80th day and 120th day . The percent loss in weight due to insect damage was calculated by using the following formula of Dabi et al.[10]

$$\% \text{ Weight loss} = \frac{I - F \times 100}{I}$$

Where,
I = Initial weight of seeds, F = Final weight of seeds

Observations is going on by these parameters at 40 th day, 80th day and 120th day

- Number of live insects
- Number of dead insects
- Weight of residue
- Weight of grain

TABLE 1

At 40th DAY (Group A control, Group B1, B2, B3-Tablet, Group C Standard)

Sr. No.	Assessment parameters	Group A	Group B1	Group B2	Group B3	Group C
1.	No. of Live insects	87.33	47.33	39.66	25	3
2.	No. of Dead insects	31.33	29	46.33	61	6.33
3.	Weight of residue	1.34gm	0.82gm	0.59gm	0.28gm	0.12gm
4.	Weight of grain	498.66gm	499.18gm	499.41gm	499.72gm	499.88gm

Each value represents Mean ± Standard deviations from three replicate values.

TABLE 2

At 80th DAY (Group A control, Group B1,B2, B3-Tablet,Group C Standard)

Sr. No.	Assessment parameters	Group A	Group B1	Group B2	Group B3	Group C
1.	No. of Live insects	126.66	84	63.66	17.66	1.33
2.	No. of Dead	44	52	80.33	37.66	2.66

	insects					
3.	Weight of residue	1.89gm	0.98gm	0.67gm	0.23gm	0.09gm
4.	Weight of grain	498.11gm	499.02gm	499.33gm	499.77gm	499.91gm

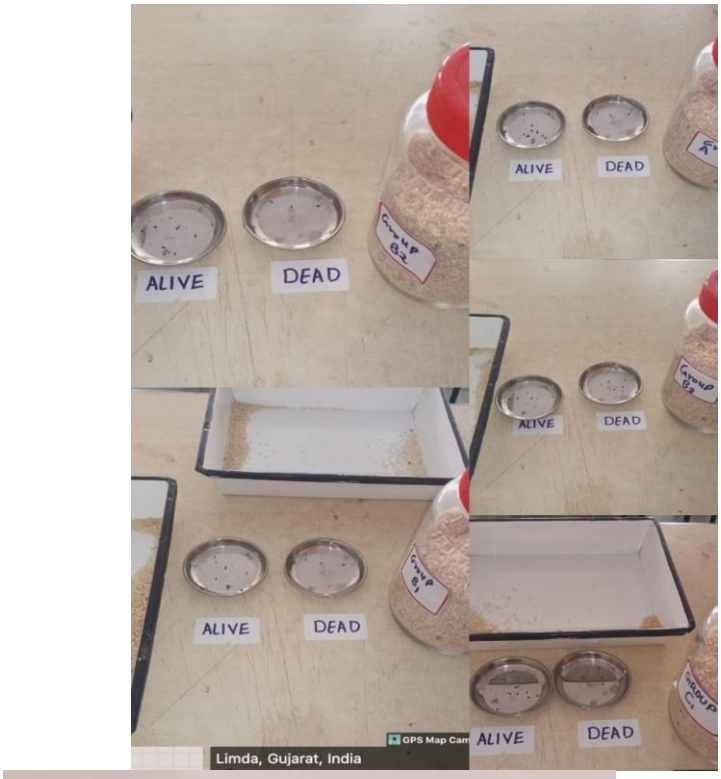
Each value represents Mean ± Standard deviations from three replicate values.

TABLE 3

At 120th DAY (Group A control, Group B1,B2, B3-Tablet,Group C Standard)

Sr. No.	Assessment parameters	Group A	Group B1	Group B2	Group B3	Group A
1.	No. of Live insects	140.33	58	51.33	15	1.33
2.	No. of Dead insects	38	62	82.66	35	4
3.	Weight of residue	1.96gm	0.75gm	0.71gm	0.18gm	0.11gm
4.	Weight of grain	498.04gm	499.25gm	499.29gm	499.82gm	499.89gm

Each value represents Mean ± Standard deviations from three replicate values.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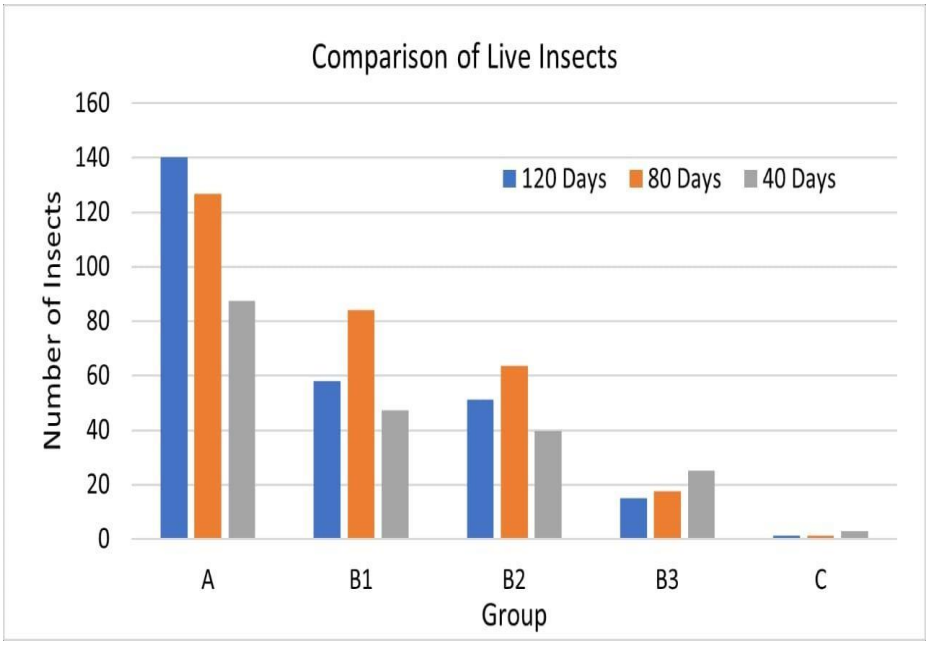
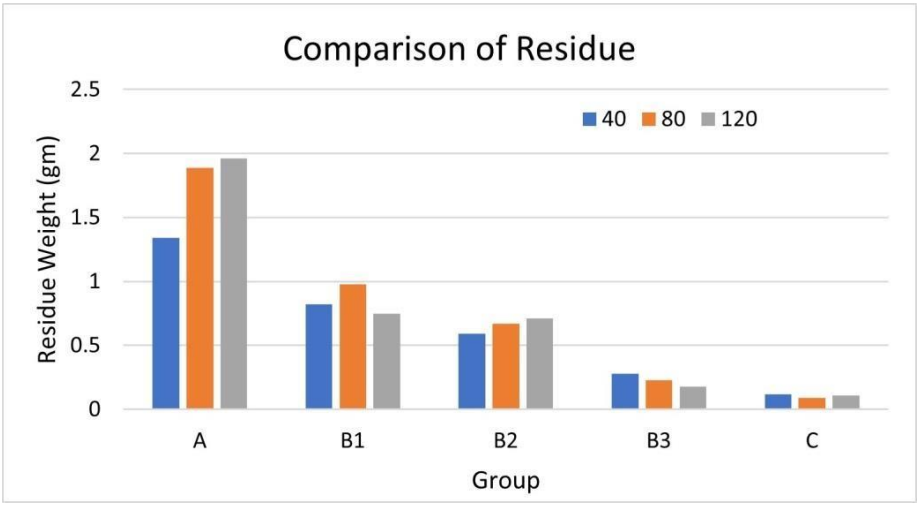
Limda, Gujarat, India

Figure (a)



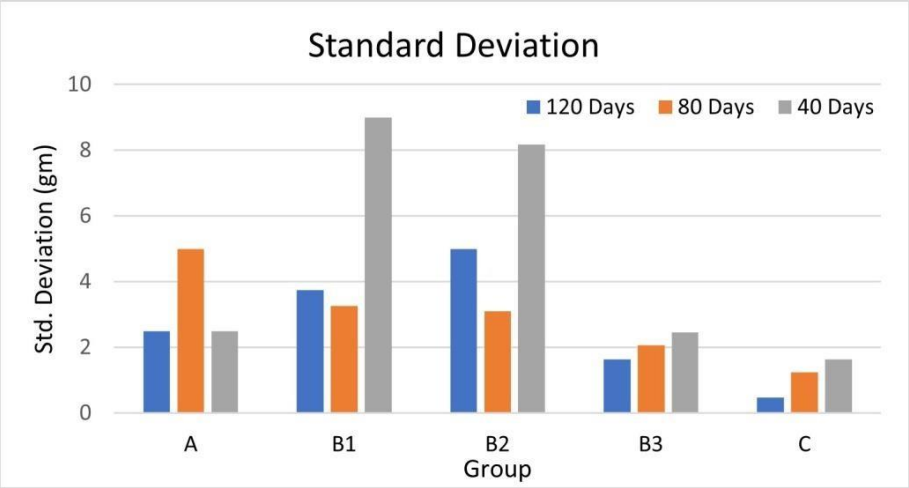
A: Untreated group, B1: 5gm of Cassia tora tablet, B2 : 10 gm of Cassia tora tablet, B3: 15 gm of Cassia tora tablet, C : Parad tablet

Figure (b)



Effect of different concentrations of *Cassia tora Tablet* on: (a) number of surviving adults; (b) weight of residue of *Tribolium castaneum* in stored brown rice seeds 40th day,80th day and 120th day after infestation.

Figure (c)



A: Untreated group, B1: 5gm of Cassia tora tablet, B2 : 10 gm of Cassia tora tablet, B3: 15 gm of Cassia tora tablet, C : Parad tablet

RESULT

The results of the effects of different concentrations of the Herbal tablet on adult mortality and survival rates of *Tribolium castaneum* are presented in respectively Table 1, Table 2 and Table 3. Weight loss of seeds and Residue weight after removing the bettles are also presented in further Tables. Differences among the botanical pesticides were significant ($P < 0.05$) for all the parameters evaluated in this study even though each of the herbal tablet was generally less effective than parad tablet applied to Brown rice. From the results in Figure (a), all the three concentrations of Herbal tablet were effective against the insect, albeit to significantly varying degrees of efficiency. In each treatment, there was a higher bettles mortality rate following an increase in the concentration and duration of exposure to the Herbal tablet. Mortality rates of adult bettles taken at 40th days after infestation showed that Parad tablet was the most effective, resulting in over 95% mortality of the adult insects, perhaps on account of the fact that this product is a conventional synthetic insecticide specifically formulated with high insecticidal activities on stored grains.

On the 40th day observation after insect release, there was 3.00 adult emergence in Parad tablet treatment and in
other tablet treatments the mean number of adult *Tribolium* insects ranged from 47.33 in 5gm of Herbal tablet treatment to 39.66 in 10 gm of tablet and 25 insects in 15 gm of tablet treatment while the control treatment recorded 87.33 adults Table 1. Similar trend was noticed even at 80 and 120 days after insect release with negligible number of insects developed in Parad tablet treatment i.e. 1.33 respectively. The untreated control treatment recorded 126.66 and 140.33 adults at 80 and 120 days after insect release, respectively.
Consequently, there was 0.09gm weight loss of grain in Parad tablet while in the other treatments the weight loss varied between 1.89 in untreated and 0.23 in the treatment of 15gm of Cassia tora tablet and respective concentration on 40th day observation. On 80th day and 120th day observation similar result was found.

Of the three concentration of Herbal tablet treatment, the highest adult insect mortality rate was recorded in the treatment with the highest concentration (15 gm) of Cassia tora . In Table 2 On 80th day observation higher bettles mortality rate was also recoated in 15gm of Cassia tora tablet. The mortality rates of the different concentration of Herbal tablet were expressed as the survival percentage of bettles at varying concentrations of the plant materials and periods of exposure. All the Herbal tablet in different concentration significantly reduced adult survival of *Tribolium castaneum* 120 days after infestation, relative to the control at $P < 0.05$ (Figure a, b and c).

Interestingly, the proportional concentration of Cassia tora tablet led to an enhanced performance of the plant materials for both adult bettles control and weight of grains a than when seeds were treated with 100% of either of the botanical insecticides used in this study. Effectiveness of the different single pesticides evaluated in this study was therefore ranked as: Parad tablet > 15gm of Cassia tora tablet > 10gm of Cassia tora tablet > 5gm of Cassia tora tablet > no protection.

DISCUSSION

India's grain production has steadily increased due to advances in technology but post harvest loss is constant at 20% due to insects, pest, pathogens, rodents and improper facilities of storage because of this the concept of preservation came into existence. Some insects leads to the hydrolysis and oxidation of stored grains and decreases the level of nutrients. Insects like sitophilus oryzae cause the damage to Brown Rice (Grain) and make grain hollow, fragile, and powdery, increase dampness. So qualitative and quantitative value of food grain decreased.

Grain production is seasonal while demands for grains are more evenly spread throughout the year so there is need to meet average demand during off season period. The chemical preservatives are carcinogenic, hazardous to known target organism and lead to development of insecticide resistance in insect pest. Majority households use Parad Tablet in daily routine life which has side effects such as blurred vision, weakness; nervousness.There is limited information on the use of plant products as bio-insecticides.

C. tora is commonly found in waste grounds and secondary forest, and grows wild along roadsides throughout the tropical and subtropical plains of India, Korea, China, Japan, Philippines, Vietnam, Indonesia and North America. [11]
In Ayurveda it is known as Chakramarda. Chakramarda is found abundantly everywhere in India. It possess Aantiseptic, Anthelmintic[12], Ant parasitic, Antioxidant, Vermifuge, Purgative activity. Ononitol monohydrate isolated from the ethyl acetate extract of *Cassia tora* L. leaves using column chromatography was evaluated for its antifeedant , larvicidal and growth inhibitory activities against *Helicoverpa armigera* and *Spodoptera litura* at different concentrations of 125, 250, 500 and 1000 ppm. Leaf disc no-choice method was used for the bioassay.[13] ononitol monohydrate showed a strong antifeedant activity of 74.57% and 69.05% against *H. armigera* and *S. litura*, respectively at 1000 ppm concentration . Ethanolic and aqueous extracts obtained from the leaves of *C. tora* were investigated for their

antibacterial activity inhibition at 0.15 mg and 0.31 mg doses respectively. Both the extracts exhibited significant antibacterial activity when compared with the standard reference drug, ciprofloxacin .[14] Leaves extract also affected *M. gypseum* conidial germination. In another study, methanol leaves extract retarded the growth of four pathogenic fungi in order of *T. rubrum>T. mentagraphytes> A. fumigatus> M. Canis* [15.]

Leaves and stems of *C. tora* contain fatty acid esters like palmitate (20.8%), stearate (6.4%), oleate (5.7%), linoleate (13.1%), linolenate (26.0%) and other shorter or longer homologs of straight or branched chain compounds (C34). Emodin, tricontan-1-ol, stigmasterol, β-sitosterol-β-D-glucoside, succinic acid, *d*-tartaric acid, uridine, quercitrin, isoquercitrin [16] and ononitol monohydrate have also been reported from the leaves of this plant [17.] Besides, leaves and seeds contain anthraquinones like chrysophanol, physcion, emodin, rhein, euphol, basseol, obtusifolin, obtusin, chryso-obtusin, rubrofusarin, aurantio-obtusin, chrysophonic acid-9-anthrone including their glycosides and naphthopyrones like rubrofusarin, orrubrofusarin, naptho-alpha-pyrone-toralactune, cassiaside including their glycosides [18,19,20,21]

The secondary metabolites of Cassia tora play an important role in insecticidal, hormonal and antifeedant activities against insects . Antifeedant and insecticidal activities of this plant extracts and their bioactive compounds against several insect pests have been demonstrated above. This plant has chemical defense mechanisms against insects and other organisms; these defense mechanisms generally affect common biochemical and physiological functions . So by this Observational study (Cassia tora Tablet) Botanical pesticides tend to have broad-spectrum activity, are relatively specific in their mode of action and safe to living organisms and environment; they could be easily produced by farmers and small-scale industries . On the basis of our study, further experiments on the screening of similar anthraquinones and lead optimisation through chemical studies is well merited.

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