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Research Article

Cassia tora (L.) Seeds, An Alternative Host to *Callosobruchus subinnotatus* (Pic.) Infestation: A Preliminary Research Note

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ABSTRACT

An investigation was carried out in the laboratory of the Department of Microbiology, Federal University Dutsin-Ma to identify and evaluate the effect of an insect pest attack on the proximate composition of *Cassia tora* L. in Dutsin-Ma, Katsina State, Nigeria. Laboratory culture of naturally infested seeds of *C. tora* was kept at 20-25°C ± 2°C and 70 % relative humidity in a plastic cup measuring 8.80 cm (outside lid diameter) cut at the centre (5.80 cm inner diameter) to complete metamorphosis. The emerging adult was taken to the Insect Museum, Institute for Agricultural Research, Ahmadu Bello University, Zaria for identification. The result of the identification revealed it as *Callosobruchus subinnotatus* Pic. [Coleoptera: Bruchidae]. The insect is widely known to be a primary pest of Bambara nut, *Vigna subterranean* (L.) Verdcourt. The insect is reported in this research as an alternative host in periods when Bambara nut is not available. Therefore, farmers in the area should observe adequate farm sanitation by keeping their farms devoid of *Cassia tora* weeds to eliminate likely hibernation sites.

Keywords: *Callosobruchus subinnotatus*; *Cassia tora;* Infestation; Alternative Host*;* Weed

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INTRODUCTION

Weeds are plants that are growing out of place. Crop production and weed occurrence are associated reciprocally. Weed eradication in crop production is difficult to achieve and often time-wasting. However, their management becomes inevitable for an increased yield. Kumar *et al*. [2021] viewed weeds as a complete menace as they compete with cultivated crops for the essentials of life. Apart from being useful for serving as food, feeds, or provision of reproductive sites for other organisms [Singh and Singh, 2016], weeds were known to harbour pests and disease organisms. Thus, control of these pests proved difficult to be achieved.

Cassia tora (L.) syn. *C. obtusifolia* (L.), is an annual herb growing wild in semi-arid regions as a weed. It is commonly referred to as sickle senna or sicklepod and popularly called "t*afasa*" in Hausa. The plant is widely distributed in the Sudano-Sahelian savanna of Nigeria [Aliyu, 2006]. Dasuki *et al*. [2014] reported that it is a common weed in open undisturbed areas of Arid lowlands and undisturbed areas of Hawaii. It also occurs in the states of Uttar Pradesh and Madhya Pradesh in India [Shreeji Agro, 2014]. A member of the Caesalpiniaceae subfamily of the Leguminosea family. It grows erect with multiple branches reaching up to a height of 90 cm

[Akobundu and Agyakwa, 1987]. Senna is an invasive weed capable of dominating farmlands due to its high seed production capability. All parts of this plant are useful, including the leaves, seeds, and roots as reported by Shreeji Agro [2014] and Aliyu [2006]. Its leaves are obovate and alternate, consisting of three pairs of leaflets. The leaflets are opposite and pinnately arranged [Plate 1]. The leaves are widely eaten as an additional source of food mixed with groundnut cake "kuli-kuli" amongst the Hausa community. The flowers are brightly yellowed. The rhombohedral brown seeds are enclosed in highly beaked, curved, brown pods of 12-18 cm long [Plate 2] enclosed with 18-28 seeds. It is a dry dehiscent pod-bearing plant.

Due to its vigorous growth habit, it is typically the first plant to sprout following the first rain after a long period of dry season, making it an important source of pasture for grazing animals. The cosmetic and livestock feed formulation industries both value C. tora seeds as raw materials in the cosmetic industry as well as in the formulation of livestock feeds including fishes [Altrafine, 2013; Dasuki *et al*., 2014]. The leaves are a precious food product commodity across international borders. The dried leaves of *C. tora* are traded internationally, between Nigeria and Niger Republic [Muhammad *et al*., 2017]. The weed was widely reported to be used in ethnomedicine. Chandan *et al*. [2011] and Aliyu [2006] reported the utilization of *C. tora* leaves in mild laxatives, eye diseases, liver stimulants, heart tonics, dysentery, and anthelmintics or relieving constipation. Altrafine [2013] reported dried and fresh leaves are used in northern Nigeria in the treatment of ulcers, ringworm, and other parasitic skin diseases. The seeds of the plant are used greatly by the Ancient Chinese as an herb [Sheeji Agro, 2014]. Altrafine [2013]) reported leaves of *C. tora* as containing natural chemicals such as chrysophanic acid-9-anthrone, a valued fungicide often used as a natural pesticide in organic farms in India.

Callosobruchus subinnotatus is an insect that was widely known to attack grain legumes [Nyamador *et al*. 2016]. Maina and Lale [2004] stated that *C. subinnotatus* is one of the field-to-store bruchid pests that attack grain legumes in tropical Africa and Asia. It is an economic and primary insect pest confined to Bambara groundnut, *Vigna subterranean* (L.) Verdcourt [Ofuya, 2001; Maina and Lale, 2004; Ibrahim and Isah, 2014, Maina *et al*., 2011]. According to Nyamado *et al*. [2016] it is the most significant depredator of Bambara groundnut seeds in West Africa. Ofuya (2001), argued that this pest's life cycle is comparable to that of the cowpea seed bruchid, *Callosobruchus maculatus* (F.). Infestation starts from the field and continues under storage. The bruchid attack on Bambara nuts causes substantial losses in quality and quantity to Bambara nuts harvested and placed on the surface for further drying [Maina *et al*., 2011; Ibrahim and Isah, 2014]. The developing larva lives and feeds within the seed's cotyledons turning it into a mass of brown powder. This research preliminary identifies and reports *C. tora* serves as an alternative host to *C. subinnotatus* a widely known insect pest of Bambara nut in the study area.

MATERIALS AND METHODS

The investigation was carried out in the Microbiology laboratory, Federal University Dutsin-Ma, Latitude 11°07'49" to 13°22'57"N and between Longitude 6°52'03" to 9.9°02'40"E in the Sudan Savanna ecological zone. Dried seeds were collected after a rainy season on the outskirts of Dutsin-ma Town. The seeds that were naturally infested (from the field) were collected and stored in polythene bags and kept in the laboratory. The larvae were cultured in a plastic cup measuring 8.80 cm (outside lid diameter) cut at the centre (5.80 cm inner diameter) and covered with a white cloth fastened with a rubber band. This is to ensure free air circulation and to prevent adult insects from escaping. The container was kept in the laboratory under the temperature of 20-25°C ± 2°C and 70 % Relative Humidity until adult emergence. The emerged adult insect was identified at the Insect Museum, Department of Crop Protection, Faculty of Agriculture/Institute for Agricultural Research, Ahmadu Bello University.

RESULTS

Binomial nomenclature of the insect according to Tuda *et al*. (2006) as identified at Insect Museum, IAR/ABU Zaria.

Kingdom:	Animalia
Phylum:	Arthropoda
Class:	Insecta
Order:	Coleoptera
Family:	Bruchidae

Sub-family: Bruchinae

Genus: *Callosobruchus*

Species: *subinnotatus*

Name: *Callosobruchus subinnotatus* Pic, 1902

Nature of damage of *Callosobruchus subinnotatus* on *Cassia tora*

Sharp, circular punctured holes were observed on the surface of *C. tora* pods. This indicated that eggs were singly laid [Plate 3] on the surface of the seeds [Plate 4]. Upon hatching, the first instar larva bore through the pods and lived into developing weed seeds destroying the seed cotyledons and turning it into a mass of reddish powder. The larva of this insect does the damage [Plate 5]. Exit holes were seen as evidence of larval activity on the seeds [Plate 6]. Pupation occurred in a hard pupal case outside the seeds. Later, the adult emerges after metamorphosis completion [Plate 7] and starts another life cycle.

DISCUSSION

Insect pests associated with this nature of damage were the coleopteran insects, to which *C. subinnotatus* belongs. Their feeding habits convert tissues into masses of powder substances. The attack on the Bambara nut by *C. subinnotatus* converts the tissue into a mass of reddish powder collected at the bottom of containers [Muhammad *et al.*, 2017]. This finding agrees with the observation of attack on beans by cowpea weevils, *Callosobruchus maculatus* L. one of the important insect pests of the field-to-store pest. A member of the genus *Callosobruchus.* The behaviour, morphology, and nature of damage of *C. subinnotatus* on *Cassia tora* L conform to that caused by cowpea beetle on cowpea [Nyamado *et al*. 2016; Lale and Vidal, 2001]. Nyamado *et al*. [2016] described it as a sympatric species to *C. maculatus*. Weeds were known to harbour pests and disease organisms that affect agricultural productivity. *Cassia tora* widely regarded as a weed in the Sudan and Sahelian Savanna is serving as an alternative new host to *C. subinnotatus*.

CONCLUSION

From the result obtained, it can be concluded that farmers in Bambara nut producing areas need to be enlightened adequately in observing farm sanitation (hygiene). Weeds should be removed to limit the food and breeding sites of this insect pest. This reduces its chances of causing economic loss on Bambara nut grown in the area. The detailed biology of the insect is suggested for further studied on *C. tora* seeds.

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Plate 1: Edible part of *Cassia tora* (leaves)

Plate 2: *Cassia tora* pods

Plate 3: Seeds of *Cassi tora* infested with *Callosobruchus subinnotatus* eggs pod

Plate 4: Punctured hole by *C. subinnotatus* on *Cassia tora*

Plate 5: *Callosobruchus subinnotatus* larvae

Plate 6: An exit hole left by *C. subinnotatus* on a *C. tora* seed

Plate 7: *Callosobruchus subinnotatus* Adult