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PLANT PRODUCTS AS SEED PROTECTANTS AGAINST WEAVER BIRD DAMAGE

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ABSTRACT

The effectiveness of crude neem cake aqueous extract, aqueous *Mormodia foetida* extract, bitter leaf and neem leaf extract at 2:1 W/W, *Gliricidia sepium* extract and ground neem cake powder as protectants of rice seeds against the village weaver bird damage was examined in test wire cages respectively. The birds were distributed randomly (1 male and 1 female, per cage) among the wire cages. The two-choice tests using the different protectants differed significantly but the ground neem cake treated rice seeds gave the best significant repellency. Ground neem cake appears to be an inexpensive, effective and a safe bird repellent seed treatment.

KEY WORDS: Weaver birds; rice; neem cake; protectants; bird repellent.

INTRODUCTION

In sub-saharan Africa granivorous weaver birds are often locally abundant on rice fields where they have become major pests to farmers (Park, 1974; Funmilayo and Akande, 1974). Damage may occur from planting (direct seeded, broadcasted or in nurseries) to maturity. Human bird scaring is a common but costly management strategy (Bruggers, 1980). Fungicides have been used as bird repellent seed treatment in the United States of America (Avery, 1984; Avery *et al*; 1994). No general repellents are available for the control of vertebrate pests (Thomson, 1995) despite increasing demand. Effective bird repellent developed are costly to formulate and aversive to humans (Nolte *et al.*, 1992). Certain insecticides have also either been used as direct repellents or indirectly by a reduction in arthropod prey (Woronecki *et al*., 1981). Pesticides were much more widely available and affordable in Nigeria during the 1970s and 1980s (Atteh, 1984) but are currently costly. In practice, human bird scaring and chemical control methods are constrained by cost, logistics and effectiveness. These have proved effective in cage and small enclosures trials (Daneke and Decker, 1988). Ironically, such investigations are scarce in Sub-Saharan Africa, where pesticides are costly, and the most notorious avian pests are abundant and endemic (Funmilayo and Akande, 1974; Park 1974). Low-resource agriculture is the major form of agriculture in sub-saharan Africa. (OTA, 1988). Farmers in low-resource areas depend on local knowledge renewable biological resources to minimise local crop failure due to pests in place of high-cost pesticides. Consequently, plant natural products have been identified to be a promising source of multipurpose and non-specific repellents against avian pests (Jakubas *et al.*, 1992). The aim of the present study was to determine whether plant natural products that are available, convenient, and safe, had potential as protectants of rice seeds against village weaver birds.

MATERIALS AND METHODS

Experimental Animals

The study was carried out in October, 1997 in the screen house at the National Cereals Research Institute, Badeggi, Niger State, Nigeria. Twenty (10 males and 10

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females) weaver birds, *Ploceus cucullatus* were live-trapped in mist nets and held in wire cages for 7 days prior to testing to acclimatize them to captivity. While in captivity, they had free access to rice seeds in containers and water in cups. Adult birds in their breeding plumage were used throughout the experiment.

Pre-treatment Procedure

Three days before the start of the pre-test period, twelve birds were removed from their communal holding wire cages. Six test groups consisting one male and one female were each weighed and each pair was randomly assigned to individual test wire cages (1m x 1m x 2m) in a screen house. During the 3-day acclimatization period, the birds were provided with cups filled with water and two plastic food containers of untreated rice seeds. The same colour of food container were used for feeding the birds to remove feeding bias by the birds. The quantity of rice consumed by the birds in each cage was recorded.

Test Food

Rice seed was treated with the following:

1. Crude aqueous extract of neem (*Azadirachta indica*) cake.
2. Slimy aqueous extract of *Mormodia foetidia* plant.
3. Aqueous bitter leaf extract.
4. Bitter leaf (*Vernonia amygdalina*) and neem seed aqueous extract (2:1 W/W)
5. Aqueous extract of *Gliricidia sepium* leaf.
6. Ground neem cake slurry (10:1 W/W).

General Testing Procedure

Rice seed (500 g) were soaked in plant extracts of 1, 2, 3, 4 and 5 (W/W) for 24 hours but slurred with 6 (W/W) in a rotating tumbler respectively. Treated seeds were dried at room temperature for one day and later sun-dried for one day. Twenty-four hours before the tests began, all food containers were removed from all cages and only water was provided. This procedure was repeated daily for the duration of the experiments. The next morning, two containers with treated and untreated rice seeds and water cup were offered to each test bird pair 7 hours/day for five consecutive days in a two-choice test. The weight of rice consumed was estimated by subtracting the mass of seeds remaining in each container from the initial mass. The birds mortality was also recorded. Birds that died were removed and replaced with live birds that had previously been starved for 24 hours. Birds feeding responses and seed handling behaviour (e.g. time spent manipulating seeds, whether they were dropped, husked or bill-wiped) to treated Vs untreated (control) seeds were recorded. Previous work with distasteful substances had suggested that such reactions are more reliable indications of repulsion than reduced food consumption which is more likely to be affected by factors such as hunger, alternative food supplied and the duration of trials (Hawkins, 1977). At the end of each 5-day trial the test birds were re-weighed and released.

Germination Tests

Ten seeds samples from each treatment were counted at random and placed on filter paper in petridishes kept moist with water at room temperature. The number of seeds that germinated was recorded over 14 days

Analysis of Cage Trial

The mean body weight of the birds before and after the experiments and between sexes were compared to each other with the studentised test. Duncan multiple range tests were used to isolate means of quantity of rice consumed by the birds.

RESULTS

Pre-test

During the pre-test trials, the birds ate from the two untreated rice containers freely and randomly without any noticeable differences. However, consumption varied ($P<0.05$) among days increasing during the 3-day pre-test period. The two birds per cage ate an average of 32 gm of rice seeds (range 15 – 45 gm) daily.

Table 1 Effects of treated rice on weaver bird repellency

	Treatment	Rate of Application	Mean Weight of Rice Consumption
1	Neem cake extract	(1:1v/w)	59.02a
2	Slimy plant extract	(1:1v/w)	44.48abc
3	Bitter leaf extract	(1:1v/w)	38.33bc
4	Bitter leaf + neem extract	(1:1v/w)	56.76a
5	*Gliricidia sepium* extract	(1:1v/w)	53.46ab
6	Ground neem cake slurry	(1:10 w/w)	27.79c
	C.V. (%)		27.64

Mean values followed by the same letter are not significantly different at 5% level of probability (DMRT).

Weaver Bird Reaction to Treatments

There were significant differences among the reaction of the birds to the various protectants (treatment) but the ground neem cake slurry gave the best repellency (Table 1). During the 5-day test period, rice consumption varied among treatments being highest with neem cake extract (59.02 g) and lowest with ground neem cake slurry (27.79g). Additionally, across the six treatment trials, more seeds were removed from the untreated seed containers than from the treated seed containers. However, the birds eating treated seeds with neem cake, *Mormodia foetida*, bitter leaf, bitter leaf plus neem and *Gliricidia sepium* extracts did not react as if the seeds were distasteful or unpalatable.

During feeding, birds were normally silent or uttered soft contact calls. When seed treated with neem cake slurry was picked, husked and swallowed the birds quickly went to dip and withdraw their bills several times into the water cups shaking their heads frantically to regurgitate the rice seeds from the crop. The birds became highly irritated and such swallowed seeds were later vomitted into the water cups or flung out of the mouth by vigorously shaking the head and uttering distress calls.

Weight Change

The initial mean weight of males and females were 37.94 gm (± 5.32 SE) and 35.40 gm (± 4.30 SE) respectively. At the end of the experiments, the average weight of males and females were 36.46 gm (± 5.92 SE) and 34.42gm (± 4.20 SE) respectively. The weight loss was significant in males only ($P<0.05$).

Germination Tests

In our germination tests, 90% of the ground neem cake treated seeds and 95% of the control seeds had germinated after 14 days. Overall, percent germination did not record below 90% in all treated seed samples.

DISCUSSION

We found that it was difficult for the birds to distinguish the treated seeds from the untreated until it was eaten. In addition, the similar containers used to serve the treated and untreated seeds did not make it easier for the birds to select preferred food until it was eaten. Despite this, the birds seemed to quickly identify the different seed category as indicated by the increased consumption of the untreated (control) seed. This also indicated that avian responsiveness to chemical stimuli from natural products are not readily predictable from standard physio-chemical parameters (Kare and Mason, 1986). However, the significant differences in overall repellency to plant products-treated seeds could be further evaluated only by interpreting the behavioural differences as

tending to inhibit or stimulate feeding (Dethier *et al*; 1960). We suspect that after eating the treated seed, the birds were subsequently able to differentiate between treated and untreated seeds by the subtle differences in appearance and smell imparted by the different treatments.

The present studies have clearly demonstrated marked repulsive effect on village weaver birds of ground neem slurry applied to rice seeds. The birds response to the ground neem cake slurry was the most obvious which included irritation, vocalization, vomiting and generally repulsive reaction. Rinsing the bill in water and bill-wiping did not immediately cleanse the neem effect on the seed, for when adjacent untreated seeds were picked, they were also dropped and bill rinsing and wiping continued for a period of time. It is therefore possible that under natural field conditions, village weaver birds will avoid planted seeds that had been treated with ground neem. Based upon our present results, the use of ground neem slurry may hold promise as a relatively inexpensive treatment. A plausible explanation to weight loss would probably be the adverse effect of captivity and lack of natural diet on the birds.

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