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Aqueous Fruit Extract of *Cucumis metuliferus* E Mey. Ex Naud (Cucurbitaceae) Alters Behavioural Activities In Chicks

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Abstract

The changes in behavioural activities, as a result of the administration of graded doses (500-1500 mg/kg,ip) of the aqueous fruit extract of Cucumis metuliferus were evaluated in 2-day old chicks. The results showed that the extract produced a biphasic alteration in the behavioural activities. A dose of 1000 mg/kg, ip produced a significant ($P<0.05$) increase in pecking activities and escape episodes. Low dose (500 mg/kg,ip) and high dose (1500 mg/kg,ip) produced an insignificant ($P>0.05$) alteration in pecking at self, food and non-food items, while there was a significant ($P<0.05$) increase in escape episode which was dose and time dependent. This work showed that Cucumis metuliferus produced dose-dependent increase in CNS activities.

Keywords: Extract; pecking; escape episode; behavioural activities.

Introduction

Cucumis metuliferus is a common creeping plant found in Jos, Plateau state, Nigeria. It is locally called 'gautar kaji' literally meaning garden egg for chicks. It is claimed by local poultry farmers to be useful in the treatment of coccidiosis. They also claim that the fruit is used to enhance appetite in inmunocompromised patients (personal communication, 2007). *Cucumis metuliferus* belongs to the family *Cucurbitaceae*, and is a monoecious, climbing, annual herb that can be grown practically anywhere, provided the season is warm (Benzioni et al., 1993). The plant is endemic to the semiarid regions of Southern and Central Africa (Morton, 1987), the fruits are ovoid berries of 8-10 cm long and 4-5 cm in diameter, reddish orange at maturity, hanging, covered with strong spiny outgrowths; and the seeds are embedded in the mesocarp which is emerald green and consists of juicy, bland-tasting tissues. It is commonly known as African horned cucumber, melano, Jelly melon, and kiwano. The fruits occur in two forms: the bitter and non-bitter forms, which occur mostly in the wild state. The bitter form contains cucurbitacins (triterpenoids), which is a highly toxic compound (Teuscher and Lindequist, 1994). The non-bitter form has been found to be less toxic and has also been widely cultivated (Enslin et al., 1954; Andeweg and De Bruyn, 1959). It is reported that the fruits and seeds of *Cucumis metuliferus* are eaten raw as supplements by local populations of Africa (Bruecher, 1977; Keith and Renew,

1975). Reports have also shown that the seeds can be ground into fine flour, made into an emulsion with water, and then eaten to expel parasites from the body (Chiej, 1984).
The aim of this study, is to investigate the effect (if any) of the fruit on some behavioural parameters in 2-day old chicks.

Materials and Methods

Animals

Chicks were obtained on the day of hatchery from ECWA farms, Bukuru, Jos, Plateau state, Nigeria. They were fed with standard feed daily (chick starter, Vital Feeds, Nigeria) and allowed water *ad libitum*. The chicks were kept to acclimatize in the laboratory environment before the research work commenced. Experiments were conducted when the chicks were 2 days old.

Preparation of Plant Extract

The plant *Cucumis metuliferus* was collected from Chong 'o peng, Jos south, Plateau state, Nigeria and identified by Professor C.O. Akueshi, Department of Botany, University of Jos, Nigeria. Further authentication was done by matching features and description obtained from the internet with that of the sample obtained.
The mesocarp of the fruits (greenish and consists of juicy bland-tasting tissues) and seeds were carefully scooped out of the pericarp using a spatula, and well stirred to separate the yellowish fiber portions and sun-dried for 7 days. To separate the seeds from the greenish fluidy portion, sieves (250 mm screen-size) were used. The resultant mixture was then spread in trays and placed in an oven set at 55^{o}C until it was dried. It was then mixed with the yellowish sun-dried fibers portion and then pounded to powder using pestle and mortar. The powder was stored at room temperature in an airtight container prior to use.

Behavioural studies

A total of twenty chicks were used. Chicks were divided into four groups with five chicks per group and treated as below:
Group I: treated with 500 mg/kg, ip of the extract
Group II: treated with 1000 mg/kg, ip of the extract
Group III: treated with 1500 mg/kg, ip of the extract
Group IV: Control (treated with 0.2 ml distilled water, ip)
Chicks were observed for 150 minutes for behavioural activities such as pecking (at food, non-food, self), flight or escape episodes, aggressive behaviour. Two animals were observed at a time.

Results and Discussion

Figure 1 revealed that *Cucumis metuliferus* at the dose points of 500, 1500 mg/kg did not produce a significant ($P<0.05$) change in pecking activities at self. While at the dose of 1000 mg/kg there was a significant ($P<0.05$) dose and time dependent increase in pecking at self. Pecking on food (Fig. 4) also showed a significant increase in activity with 500 mg/kg at 60 and 150 minutes, while 1000 and 1500 mg/kg did not produce a significant change in pecking activity. Similarly, pecking at non-food was significantly increased at 90-150 minutes with 500 and 1500 mg/kg (Fig. 3).

The Escape episodes (Fig. 2) for chicks revealed a dose and time dependent change in activity from 500mg/kg to 1500 mg/kg. There was significant alteration in behavioural activity in 2-day old chicks at 1000 and 1500 mg/kg. 500 mg/kg of extract demonstrated very low effect on escape episodes.

The central nervous system (CNS) of the chick at birth lacked a functional blood brain barrier (Spooner and Winters, 1967), thus, it permits investigation of drugs that have CNS activity. This lack of functional organisation allows the CNS of chicks to respond to neuropharmacological agents in a manner similar to mammals. Various behavioural activities induced in laboratory animals are reported to be mediated via certain substances (Maj et al., 1997). According to Meller et al., (1989) increase in activation of CNS is caused by activation of dopamine postsynaptic receptors. Dopamine and 5-HT are known to be involved in the expression of (environmentally induced) behavioural disorders e.g. obsessive compulsive disorder in chicks or adults (Bolhuis et al., 2000). Serotonergic and dopaminergic receptors have been implicated in pecking activity and are demonstrated to be mediated via corticosteroid modulation (Bolhuis et al., 2000).

Stereotypies are generally defined as unvarying repetitive behaviour patterns that have no obvious goal or function. It has been suggested that pecking has stereotypic characteristics as its motor pattern closely resemble drug-induced stereotypic pecking in chicks (Bilcik, 2000). Dopamine receptor agonist like apomorphine and amphetamine induce stereotyped pecking responses in birds, suggesting a possible involvement of the dopaminergic transmission. Higher 5-HT turnover was characterized by low self-pecking. Self-mutilating feather pecking disorder (FPD) in birds is a stereotypy that seems to be under the control of 5-HT mechanisms. Clomipramine, a tricyclic anti-depressive drug that inhibits the re-uptake of 5-HT and noradrenaline, was effective in alleviating severe FPD in birds (Bordnick and Thyer, 1994).

Though, the exact mechanism of action in which the extract altered behavioural functions cannot be deduced at this stage of the work, it is possible that the mechanism

could be mediated via 5-HT and dopaminergic transmission. Work is on-going in my laboratory to determine further activities on the plant.

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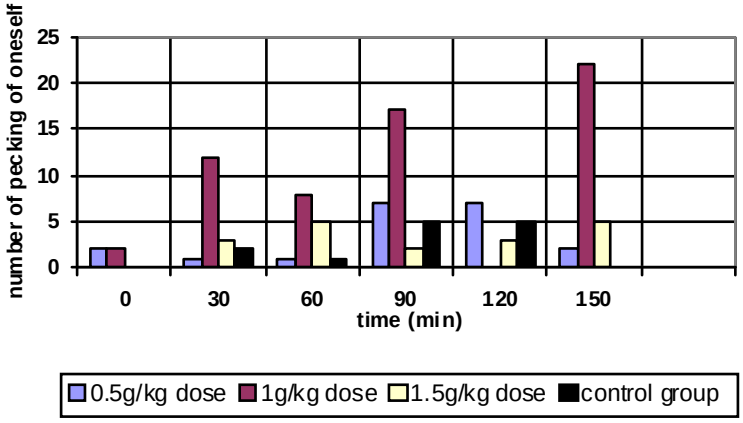

Fig. 1: Effect of extract of *C. metuliferus* on pecking on self in 2-day old chicks

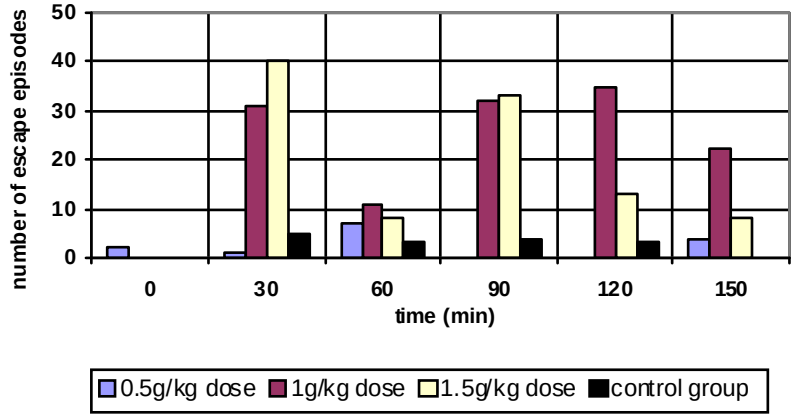

Fig. 2: Effect of extract of *C. metuliferus* on escape episodes in 2-day old chicks

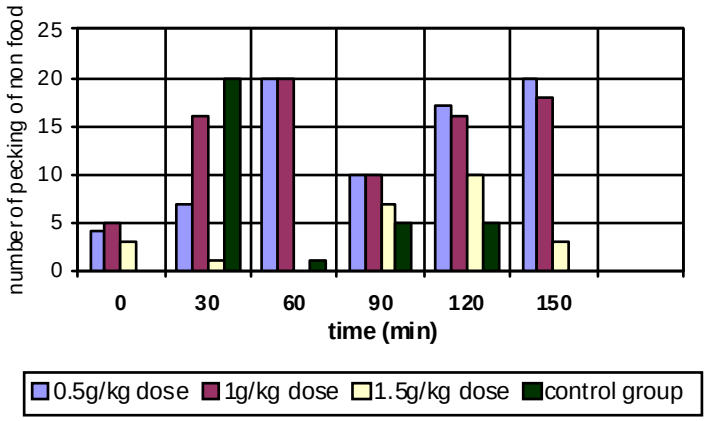

Fig. 3: Effects of extract of *C. metuliferus* on pecking at non-food in 2-day old chicks

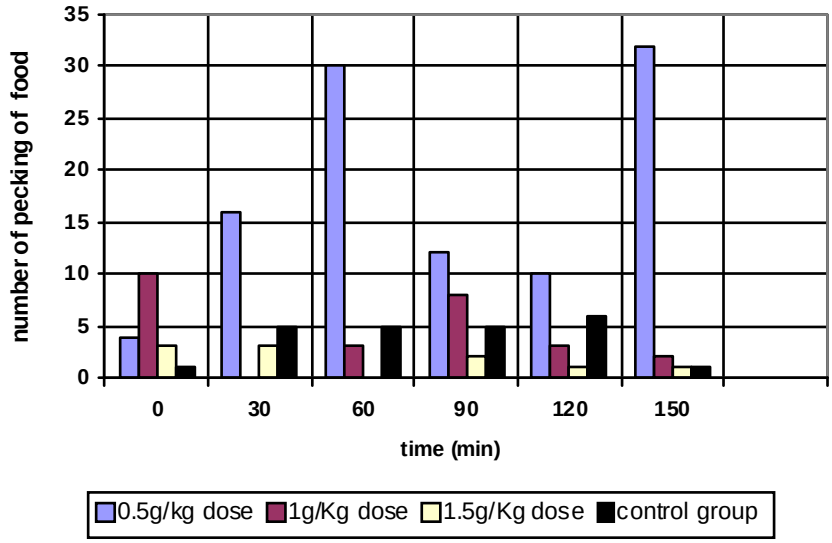

Fig. 4: Effect of extract of *C. metuliferus* on pecking on food in 2-day old chicks