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THE EFFECT OF SEED COAT COLOUR AND DEPTH OF PLANTING ON BUSHFOWL DAMAGE TO PLANTED MAIZE SEEDS

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ABSTRACT: The bushfowl (*Francolinus bicalcaratus bicalcaratus* L.) is a major avian pest on planted maize seeds. Maize seeds coloured green and normal white seeds were planted at different depths of 2.5 cm, 5.0 cm, 7.5 cm, 10.0 cm, 12.5 cm, and 15.0 cm in three different trials between 1987 and 1988. The effect of planting depth was highly significant. Damage occurring to seeds planted at a depth of 2.5 cm was significantly higher than all the other depths, even though there was not significant damage among the other depths.

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INTRODUCTION

The bushfowl (*Francolinus bicalcaratus bicalcaratus* L.) is one of the most devastating avian pests on a variety of crops including maize in Nigeria.

The damage by bushfowl to maize and other cereal crops such as rice is most critical during the planting stage. The mode of operation is by the use of its strong beaks to dig through the soil and pick out the planted seeds.

However, although the beak of the bushfowl is strong, nevertheless, it is very vulnerable. In captivity the bushfowl often "debeaks" itself, breaking the tip in its struggles to escape (Akande 1977). At the Institute of Agricultural Research and Training, Moor Plantation, research into economical, nontoxic and local ways of controlling bushfowl and other noxious vertebrate pests, is being carried out. One such was the discovery of the repellent effect of green colour on bushfowl damage to maize (Akande and Obajimi 1982).

Peasant farmers in the savannah zone of Oyo State of Nigeria are sometimes observed to use sticks or clubs instead of cutlasses for planting maize. The stick/clubs are used to carve holes in the ground into which seeds are put and then covered with soil. The majority of peasant farmers in this area use cutlasses for planting maize. The tip of the cutlass is used to raise the earth while the seeds are dropped under the tip of the cutlass. The cutlass is then withdrawn burying the seeds sown under it. It is easier and faster using the cutlass for planting maize; and seeds sown using the cutlass are buried at shallower levels than when sticks/clubs are used.

Since during domestication procedures of the bushfowl, the beak was often tipped off, it is therefore possible to exploit the use of the beak in controlling its mode of feeding.

The aim of the experiment reported in this paper is to investigate the effect of depth of planting and seed coat colour on bushfowl damage to germinating maize.

MATERIALS AND METHODS

A white-seeded maize cultivar, TZPB, was used for the experiment. A plot is made up 12 m (40 ft) long and 0.9 m (3 ft) apart from another row. The maize seeds were planted 22.5 cm (9 in) apart along the row. A slit plot design was used. Seed colour was the main plot while depth of planting was the subplot. A hand planter with a contrivance for adjusting the depth at which seeds were planted was used.

Six planting depths were used; viz: 2.5 cm (1 in) to correspond to the control depth for planting using cutlasses, 5.0 cm (2 in); 7.5 cm (3 in.); 10.0 cm (4 in); 12.5 cm (5 in)

and 15.0 cm (6 in). The two seed coat colours were white, the normal seed coat colour for TZPB, and green obtained by dyeing white seeds in green jelu dye.

Assessment of damage by bushfowl was conducted daily after planting and counting lasted 3 weeks, which is the optimum bushfowl damage. Parameters of bushfowl damage applied were seeds dug up, seeds dug up and eaten, and uprooted cotyledons. These were all added up against total number of stands.

The experiment was conducted in 1987 and repeated in 1988.

RESULTS

In the 1987 early season trial it was observed that the least bushfowl damage on white maize seeds occurred at 10.0 cm (4 in) depth of planting while the most severe damage was at 2.5 cm (1 in) depth of planting. There was no consistency between the depth of planting and level of damage (Tables 1 and 2). However with the other trials in subsequent seasons 1987/88, the most severe damage was consistently at 2.5 cm (1 in) depth of planting, and again the least damage occurred at the 10.0 cm (4 in) depth of planting.

Table 1. The effect of depth of planting on the damage occurring to white and green-coloured maize seeds by bushfowls in 1988.

Planting depth in cm	Seed Colour				Mean ^b over colour in degrees
	White (C1)		Green (C2)		
	% Damage	Degrees ^a	% Damage	Degrees ^a	
1 2.5	13.9	21.0	2.9	9.9	15.4
2 5.0	2.5	8.5	3.3	9.3	8.9
3 7.5	3.7	11.0	1.9	8.5	9.8
4 10.0	0.6	5.5	0.0	4.1	4.8
5 12.5	1.6	7.6	2.3	8.5	8.1
6 15.0	4.4	11.7	0.0	4.1	7.9
Mean over depth in degrees	-	10.9	-	7.4	-

^aPercentage damage transformed to $(x + 0.5)$ degrees of an angle.

^bLeast significant difference at 5% level; (i) For the effect of colour = 5.6°, (ii) For the effect of planting depth = 4.9°, (iii) For the interaction between depth and colour = 7.0°.

Table 2. The effect of depth of planting on the disturbance of seedlings from white- and green-coloured maize seeds by bushfowls in 1983.

Planting depth in cm	Seed Colour				Mean ^b colour in degrees	
	White (C1)		Green (C2)			
	% Disturbed	Degrees ^a	% Disturbed	Degrees ^a		
1	2.5	6.6	15.0	2.4	9.1	12.0
2	5.0	2.0	8.1	5.8	13.0	10.6
3	7.5	7.7	12.8	0.5	5.3	9.0
4	10.0	0.6	5.5	0.8	5.8	5.7
5	12.5	1.6	7.6	4.1	11.6	9.6
6	15.0	1.5	6.7	0.6	5.5	6.1

Mean over depth
in degrees - 9.3 - 8.4 -

^a%Disturbed kernels transformed to $(x + 0.5)$ degrees of an angle.
^bLeast significance difference at 5% level; (i) For the effect of seed colour = 3.5°, (ii) For the effect of planting depth = 5.0°, (iii) For the interaction between colour and depth = 7.0°.

Observations on the green seeds were similar to the white seeds because in all three trials, the greatest amount of damage occurred at 2.5 cm (1 in) depth of planting and the least damage occurred at the 10.0 cm (4 in) depth of planting (Tables 1 and 2). There was significant difference between the amount of severest damage to the green seeds and the white seeds at the 2.5 cm (1 in) depth of planting, the damage on the white seeds being much greater than the green seeds (Tables 3 and 4).

Table 3. The effect of depth of planting on white maize seeds.

Planting depth cm (in)	% Bushfowl damage		
	1988	1987 (late)	1987
2.5 (1)	13.91	14.01	16.05
5.0 (2)	2.45	4.21	4.50
7.5 (3)	3.74	2.50	3.01
10.0 (4)	0.62	0.6	0.0
12.5 (5)	1.64	2.2	2.1
15.0 (6)	4.4	3.50	3.5

DISCUSSION

The effect of planting depth was highly significant. Damage to seeds at a depth of 2.5 cm (1 in) was significantly higher than that to seeds planted deeper than 2.5 cm (1 in). There was no significant difference among damage done to seeds planted at 5.0 cm, 7.5 cm, 10.0 cm, 12.5 cm, and 15.0 cm depths.

The overall interaction between planting depths and seed colour was not significant. This means that the damage at each of the different planting depths is independent of the colour of seed. However, damage to white-seeded kernel planted 2.5 cm (1 in) below soil surface was significantly higher than that to green-seeded seeds planted at the same level. This means that at the normal planting depth colouring the kernels green results in a significant reduction in damage done to germinating kernels.

Table 4. The effect of depth of planting on green maize seeds.

Planting depth cm (in)	% Bushfowl damage		
	1988	1987 (late)	1987
2.5 (1)	3.1	2.89	2.01
5.0 (2)	2.54	3.28	2.51
7.5 (3)	1.51	1.93	1.52
10.0 (4)	0.65	0.00	0.40
12.5 (5)	2.34	2.32	1.94
15.0 (6)	1.56	0	2.1

The main effect of colour, depth of planting, and the interaction of both factors has no significant effect on the disturbance of planted seeds. Therefore planted seeds are disturbed by bushfowl irrespective of the colour and depth of planting.

In conclusion, it is advised that to reduce loss of damage by bushfowls to planted maize seeds, in addition to colouring the maize seeds green, planting should be done at a depth deeper than 2.5 cm (1 in), especially if it is imperative to use white seeds.

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