Effect of rubber seed meal on hatchability of hens' eggs

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(Received February, 1971.)

Rubber seed meal has been shown to be a satisfactory substitute for coconut cake in broiler and layer diets in Ceylon when used at levels up to 20-25 per cent. At these levels, the weight gains in broilers or egg production traits in the case of layers were not significantly depressed when compared to control rations containing no rubber seed meal (Buvanendran and Siriwardena, 1970).

Fertility and hatchability are two major components of reproduction in poultry and are therefore very important in flocks kept for breeding purposes. It was therefore felt that an assessment of the effect of rubber seed meal on these two traits was necessary before it could be recommended for use in breeder flocks.

MATERIAL AND METHODS

Two experiments were conducted. In the first experiment three levels of rubber seed cake were given to separate groups of White Leghorns of approximately 30 birds per group. Details of the rations are shown in Table 1. After the birds had been on the experimental diets for 10 weeks, the birds were artificially inseminated on alternate days with pooled semen from 20 White Leghorn cockerels. Eggs were collected for hatching from the second day following inseminations and incubated weekly. The infertile and dead germs were removed by candling on the 7th and 14th days. These eggs as well as those that remained unhatched at the end of 22nd day were examined and the approximate time of death determined using the criteria given by Buvanendran (1967).

In the second experiment, two groups of 26 White Leghorn pullets each, were given the diets shown in Table 1 for a period of 180 days.

From the commencement of the experiment, the birds were inseminated with pooled semen and eggs collected for incubation. Eggs were incubated weekly for the first 5 weeks of the experiment and again from the 10th to 15th week. Eggs failing to hatch were examined as before.

Table 1.—Composition of rations used in experiments 1 and 2

	Experiment 1			*Experiment 2*	
Ingredients	*Ration 1*	*Ration 2*	*Ration 3*	*Ration 1*	*Ration 2*
Ground maize	40	40	40	40	40
Coconut meal	25	15	5	25	—
Rubber seed meal	—	10	20	—	25
Rice polish	21	21	21	21	21
Fish meal	10	10	10	10	10
Shell grit	3	3	3	3	3
Bone meal	1	1	1	1	1
Salt	0.25	0.25	0.25	0.25	0.25
Vitamin-mineral supplement	At recommended levels.				

Table 2.—Fertility, embryonic mortalities in early and late incubation and hatchability in Experiment 1

Ration	*Fertility*	*Embronic Mortality*		*Hatchability*
		Early	*Late*	
1		14.06[a]	10.41[a]	75.52[a]
2		21.05[b]	14.91[a]	64.03[b]
3		30.28[c]	32.00[b]	37.71[c]

Column values not bearing the same superscript are significantly ($P<.05$) different.

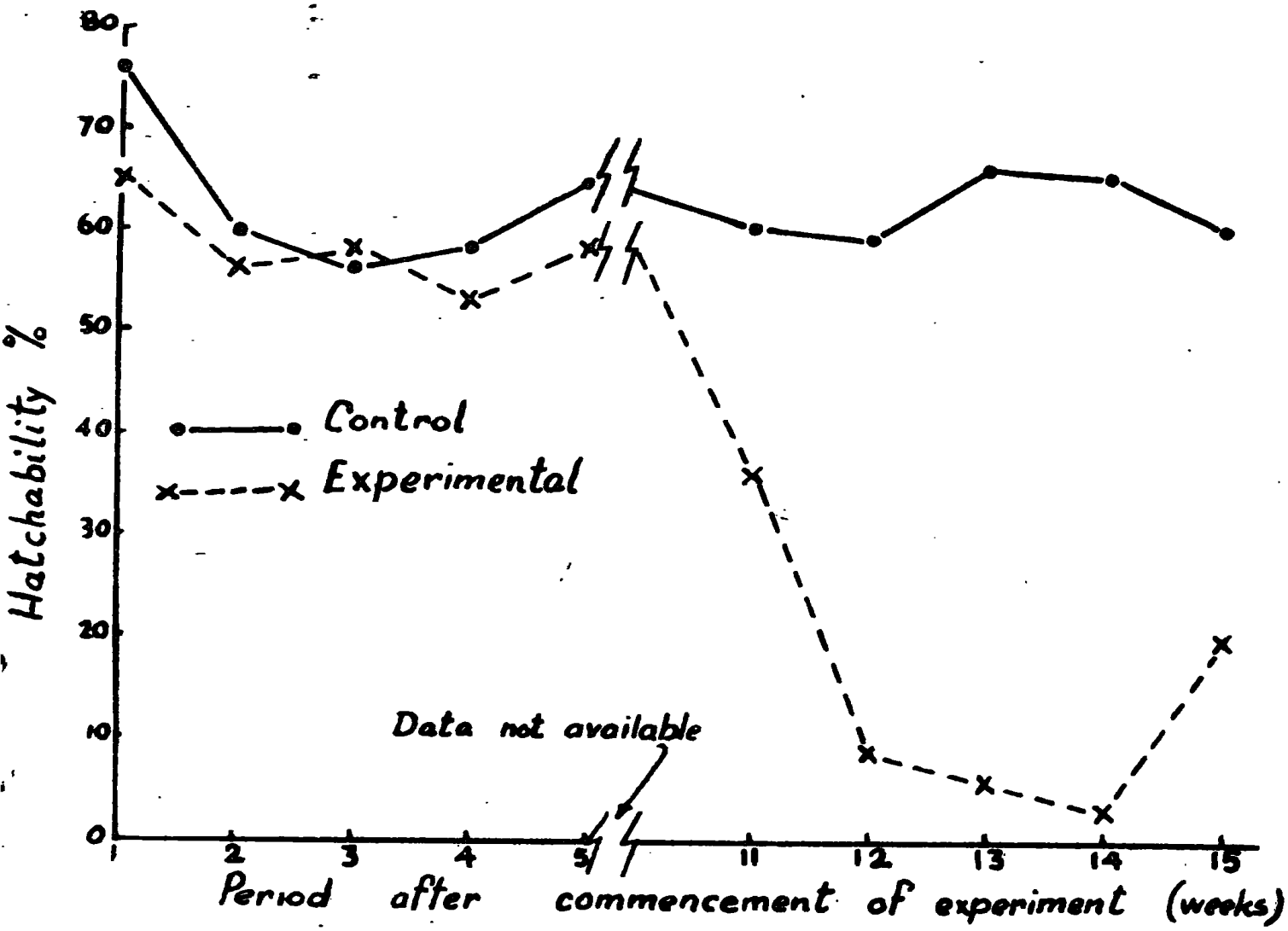
RESULTS AND DISCUSSIONS

Experiment 1. The percentage fertility hatchability and embryonic mortality in the three groups with the results of statistical analysis are summarised in Table 2. The fertility was high in all three groups and treatment differences were not significant. However, the hatchability was markedly affected in the treatment groups, the hatchability decreasing with increasing levels of rubber seed meal in the ration. The average depressions in hatchability were approximately 11 and 38 per cent (as compared to the control group 1) when the levels of rubber seed meal in the feed were 10 and 20 per cent respectively. In order to examine whether the effect on hatchability was due to mortality at any particular phase of incubation embryonic

mortality was classified into early (1-14 days) or late (14-22 days) depending on the age at which death occured. The results of individual hatches indicate that no consistent age specific pattern in embryonic mortality is discernible and that the proportions of early and late deaths were approximately similar in all three groups.

The second experiment was undertaken to examine whether the depression in hatchability occured immediately after the inclusion of rubber seed meal in the diet or whether there was a time lag before this effect was expressed. Figure 1 shows the hatchability of the control (group 1) and experimental groups (group 2) during the period of the experiment. It is clear that during the first 5 weeks of the experiment, there was no difference in hatchability between the two groups. However, from the tenth week, there was a depression in

Figure 1.—Experiment 2. Comparition of Hatchability in the Control of (0% rubber seed meal) and experimental group (25% rubber seed meal.)



hatchability in the experimental group which progressively worsened with time. Since there was an interruption in incubation from the 5th to 10th week, it was not possible to determine the exact period at which hatchability in the experimental group started to decline, but it would appear that the hatchability would have gradually declined sometime between the 5th and 10 week.

The depression in hatchability caused by feeding of rubber seed meal is probably due to the presence of a toxic factor in the meal since the hatchability decreased with increasing levels of the meal as shown in experiment 1. However, the delayed action of this toxic factor as shown in experiment 2 where the hatchability was not affected for as long as 5 weeks after the birds had been on the rubber seed meal diet suggests that the toxic factor is either stored by the hen till threshold levels are reached and then released into the blood stream thus gaining entry into the egg, or that the concentration of the toxic factor increases gradually in the blood stream but does not reach lethal levels (to the embryo) unless the meal has been in the maternal diet for about 5-10 weeks.

Rubber seed meal is said to contain a cyanogetic glycoside which under certain conditions is converted to HCN by enzymatic action. (Dawson and Messenger, 1932). The delay in expression of 'toxic' effects as shown above would rule out the possibility if HCN being the probable toxic factor since it is known that HCN is rapidly detoxicated to thiocyanate by animals and excreted in the urine so that animals consuming HCN in amounts slightly below the lethal dose even over extended periods of time can exist without showing any harmful effects (Garner, 1957). Rubber seed cake is said to contain free fatty acids (FFA) which sometimes rise to high levels of 15-18 per cent if the expression of the oil from the seeds has been delayed. It is not known whether these FFA can exert a lethal effect on the chick embroyo.

This study indicates that rubber seed meal in the form it is manufactured at present depresses hatchability and is therefore unsuitable for use in poultry breeder diets.

SUMMARY

The hatchability of eggs was compared from hens receiving different levels of rubber seed meal in their rations. Increasing levels of the meal in the maternal diets caused an increase in embryonic mortality.

There was a delay between commencement of feeding the rubber seed cake and depression in hatchability which suggests that cyanogenetic glycosides cannot be responsible for this effect.

ACKNOWLEDGMENTS

The author acknowledges the technical assistance of Miss S. K. K. Mahagedera. The rubber seed meal used in these experiments was kindly gifted by Messers. Lever Brothers Ltd. ; Colombo.

REFERENCES

BUVANENDRAN, V. (1967). A search for an association between maternal egg white protein polymorphisms and embryonic mortality in the domestic fowl. *Br. Poult Sci.* 8 : 1.

BUVANENDRAN, V. and SIRIWARDENA, J. A. de S. (1970). Rubber seed meal in poultry diets. *Ceylon Vet. J.* (In Press).

DAWSON, T. R. and MESSENGER, T. H. (1932). Rubb. Mfrs. *10*, 38 as cited by Nadarasapillai, N. and Wijewantha, R. T. in R. R. I. C. Bulletin *2*, 8-17.

GARNER, R. J. (1957). *Veterinary Toxicology*. Bailliere, Tindall and Cox, London.