

given a semi-purified casein-gelatin diet (26W), then changed to the experimental diets, and inoculated orally with *Salmonella gallinarum* 3 days later.

In each of four experiments the purified diet (26W) was given throughout to one group of chicks and a meat-meal diet was also included as a second control: the percentage survival of chicks given meat meal in each experiment, 69, 50, 57 and 57, was significantly greater than the corresponding value for diet 26W, 22, 21, 24 and 36. In the same experiments groups of forty-two birds were given diets based on six other commonly used high-protein feeding-stuffs, and each was tested in two experiments. The mean percentage survival values were: dried separated milk, 46; groundnut-cake meal, 17; sunflower-seed meal, 14; fish meal, 14; cottonseed meal, 10; and soya-bean meal, 2. None of the diets permitted the high survival given with meat meal, though dried separated milk gave almost as high a value; all the remaining diets gave percentage survival values poorer even than that of the purified diet.

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***The metabolism of fluoroacetate by plants.** By P. F. V. WARD and N. S. HUSKISSON, *A.R.C. Institute of Animal Physiology, Babraham, Cambridge*

***An organically combined fluorine compound in bone.** By R. A. PETERS and M. SHORTHOUSE, *Department of Biochemistry, University of Cambridge* and P. F. V. WARD, *A.R.C. Institute of Animal Physiology, Cambridge*

Trypsin-inhibitory and growth-depressing activities of groundnut skins (testa). By K. ANANTHARAMAN, *School of Agriculture, University of Cambridge*

Borchers & Ackerson (1947) and Woodham & Dawson (1968) reported high values for the in vitro trypsin inhibitor activity (TIA) in raw, extracted groundnut flour (RGF) making use of the haemoglobin digestion technique of Anson (1938-9). Kwaan, Kok & Astrup (1968) reported growth depression and pancreatic hypertrophy in rats fed a preparation of groundnut trypsin inhibitor. Our in vitro studies, however, showed that RGF has a TIA of only $4-5 \times 10^{-3}$ trypsin inhibitor units/mg, although for raw soya-bean meal (RSBM) our values were comparable to those reported by the other workers. Values for TIA of RGF and RSBM were in the same relative proportion as that observed by the haemoglobin method, when 0.0025 N-HCl extracts of the test materials were assayed by the synthetic substrate benzoyl, DL-arginine, p-nitroanilide (BAPA) method of Sambeth, Nesheim & Serafin (1967).

Unlike the observations of Woodham & Dawson (1968), raw groundnut skins (RGS) had high TIA with a value of 44–47 BAPA units/mg, compared with 10–13 and 60–65 BAPA units/mg for RGF and RSBM respectively. Feeding experiments were carried out with both chicks and rats to assess the effects on their growth of RGS and heated (121°; 4 h) skins (HGS) when added at different levels to a basal toasted soya-bean meal (TSBM) diet. Progressive growth depression and pancreatic hypertrophy were observed with chicks during 2 weeks when RGS were added at 4, 8 and 12% (w/w) levels in a 14% protein TSBM diet. HGS, though still trypsin inhibitory in vitro (16–18 BAPA units/mg) did not adversely affect chick growth.

Diet	Wt gain/ chick (g)	FCE*	Wt of pancreas (g/100 g body-wt)
Basal, TSBM	55	0.32	0.445
Basal, TSBM + 4% RGS	42	0.27	0.488
Basal, TSBM + 8% RGS	28	0.21	0.519
Basal, TSBM + 12% RGS	22	0.18	0.546
Basal, TSBM + 8% HGS	48	0.29	0.469

*Feed conversion efficiency = wt gain/g feed intake.

The inhibitor components in both RGS and HGS, but not in RSBM, were extractable by ethanol acidified with 1% (v/v) of concentrated HCl. Ethanol-extracted RGS when fed to chicks at a 12% (w/w) level in diets did not produce growth depression or a significant pancreatic hypertrophy, and were thus comparable to HGS. Groundnut skins have a high content of tannin, which is readily extracted with ethanol; since tannic acid has a high TIA, it may be the tannin fraction in the skins rather than a protein that is responsible for the trypsin-inhibitory and growth-depressing activities.

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Effects of raw soya-bean and navy-bean meals on germ-free and conventional chicks. By D. HEWITT and M. E. COATES, *National Institute for Research in Dairying, Shinfield, Reading*

Miller & Coates (1966) found that the growth depression due to raw soya-bean meal was less in germ-free than in conventional chicks, whereas the effect on pancreas weight was the same in both environments. We have confirmed this in a series of three experiments where the growth depression was significantly greater in conventional than in germ-free chicks ($P < 0.05$).

We have now investigated the effects of raw and heated navy-bean meal in diets