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SUPPLEMENTATION OF WHEAT FLOUR WITH PEA FLOUR

Nighat Bhatty and H.M. Chaudhry*

Supplementary value of pea flour with wheat flour at four levels (25, 50, 75 and 100 per cent) were studied in 24 weanling rats divided into six groups of four rats each. Test diets fed *ad-libitum* to all groups for 10 days gave PER values of basal and other diets containing 25, 50, 75 and 100 per cent pea protein as 0.09, 1.63, 1.19, 1.16 and 0.99 and TD values of 76.8, 82.0, 80.1, 74.3 and 81.3 per cent respectively. Supplementation improved NPU and BV of test diets. NPU values being 47.0, 61.0, 65.0, 59.0 and 67.0 whereas BV were 59.0, 75.0, 77.5, 75.5 and 80.5 per cent respectively for diets noted above seriatum of all substitutions, 11.4 per cent supplementation with pea flour proved best.

INTRODUCTION

Pakistan being a developing country has been facing the problem of protein calorie malnutrition. The worst affected groups are weaned infants, preschool children, pregnant and lactating mothers. In such a situation the only hope lies in the use of vegetable source of protein for dietary supplementation. Legumes are nutritionally important because of their relatively high protein content, ranging from 20—30 per cent. Legume proteins are considered to be a good source of lysine and as such provide this essential amino acid to enhance the nutritive value of the protein in the mixed cereal diet. Supplementary relationships have been developed between the Bengal gram and wheat (Khan *et al.* 1976-a) between the protein of defatted soyabeans and wheat (Khan *et al.* 1977) and between lentil and wheat (Khan *et al.* 1976-b). Peas have been successfully used in enhancing the nutritive value of various diets for human consumption and in infant feeding (Guggenheim and Szmelcman 1950 Tannous *et al.* 1965 and Mclaren *et al.* 1966). In this study pea flour has, therefore, been chosen to add to wheat flour and study its supplementary value.

MATERIALS AND METHODS

Wheat, peas, corn starch, corn oil, vitamins minerals and glucose

*Department, of Nutrition, University of Agriculture, Faisalabad.

were purchased from the market for the preparation of experimental diets. Dried peas were ground as such and mixed with other ingredients to form 5 experimental diets containing 10 per cent protein (Table 1). In order to measure metabolic faecal nitrogen a protein free diet (F) was also prepared. Forty-eight weanling albino rats, 23 days of age, were used for the biological evaluation of experimental diets. The rats were fed on stock diet for 7 days and then randomly divided into 6 groups of four rats each. The experimental diets (A, B, C, D, E and F) were randomly assigned to these groups and fed *ad-libitum* for a period of ten days. The temperature of the room was maintained between 24 —27°C. A sheet of filter paper was placed in each cage for the collection of faeces. Fresh and clean water was provided all the time to each group. During experimental period the data on feed consumed weight gains were collected; which was then used to calculate PER, TD, NPU and BV of the test diets.

Table 1. *Percent composition of experimental diets.*

Ingredients	A	B	C	D	E	F
Wheat flour	89.0	64.8	43.4	21.9	—	—
Peas flour	—	11.4	22.8	34.2	45.1	—
Corn starch	—	12.8	22.8	34.9	43.4	89.0
Corn oil	5.0	5.0	5.0	5.0	5.0	5.0
Vitamin mixture	2.0	2.0	2.0	2.0	2.0	2.0
Mineral mixture	4.0	4.0	4.0	4.0	4.0	4.0
	Protein Percent Distribution					
Wheat flour	100	75	50	25	0	—
Peas flour	0	25	50	75	100	—

RESULTS AND DISCUSSION

The weight gains of the experimental animals on different diets were 2.5, 62.0, 38.0, 39.5, 29.0. Analysis of variance of the weight gains showed a significant different ($P < 0.01$) between the means of weight gains of groups, fed on different diets. The maximum gain in weight was observed in rats fed diet B.

Table 2. *Weight gain, protein efficiency ratio, net protein utilization true digestibility and biological value of experimental diets.*

Description	A	B	C	D	E	F
No. of rats in each group	4	4	4	4	4	4
Days of experiment	10	10	10	10	10	10
Protein Intake	27.77	38.04	31.93	34.05	29.29	—
Weight grain/group (gm)	2.5	62.0	38.0	39.5	29.0	—
Protein Efficiency Ration (%)	0.09	1.63	1.19	1.16	0.99	—
Net Protein utilization (%)	47	61	65	59	69	—
True Digestibility	76.8	82.0	80.1	74.3	81.3	—
Biological value (%)	59.0	75.0	77.5	75.5	80.3	—

Duncan's Multiple Range Test revealed that all the experimental diets gave significantly ($P<0.01$) more weight than basal diet A. These results were in line with Tannous *et al.* (1965) Protein Efficiency Ratio for diets A, B, C, D and E were 0.9, 1.63, 1.19, 1.16 and 0.99 respectively, which improved significantly ($P<0.01$) and highest value of 1.63 was obtained for diet B. PER values of all the experimental diets were significantly ($P<0.01$) better than basal diet. It appeared that rats did not like wheat flour when compared to the combination of wheat and pea flour.

The highest digestibility (82 per cent) was found in rats fed diet B and lowest value (74.3 per cent) was found in rats fed on diet D. Analysis of variance showed a significant ($P<0.01$) difference in the T.D. obtained on various diets i.e. 76.8, 82.0, 80.1, 74.3 and 81.3 respectively.

D.M.R. Test revealed that true digestibility value for diet B was significantly ($P<0.05$) better than diet D and A but these were significantly different in diets B, C and E. It was further noted that diets E, C and A were significantly better than Diet D.

Similar results were obtained by Mclaren *et al.* (1966). Net protein utilization for diets A, B, C, D and E was 47, 61, 65, 59 and 69. The maximum NPU value (67) was found in rats fed diet E whereas minimum value (47) was observed in rats fed diet A. The NPU value of supplemented diets B, C and D were 61.0, 65.0 and 59.0 respectively. Analysis of variance showed a significant ($P<0.01$) difference in various NPU values. D.M.R. test showed that the rats fed on diets B, C, D and E retained significantly ($P<0.01$) more nitrogen than rats fed on basal diet A. The results indicated that NPU values at all levels of pea flour supplemented diets were significantly higher than those in case of

basal diet. Statistical analysis of B.V. revealed highly significant ($P<0.01$) difference among various experimental diets. D.M.R. test showed that all supplemented diets had significantly ($P<0.01$) higher biological value compared to basal diet D. It was concluded that biological value for diets A, B, C, D and E (59.0, 75.0, 77.5, 75.5 and 80.3) were improved with increasing level of pea flour in the diets as compared to basal diet. These results were similar to those obtained by Bressani *et al.* (1963), Barness *et al.* (1961), Daniel *et al.* (1968) who also concluded that the nutritive value of wheat flour was improved by the addition of L. lysine.

LITERATURE CITED

Barness, L.A., R. Kaye and A. Valyaseni, 1961. Lysine and Potassium supplementation of wheat protein. Am. J. Clin. Nutr. 9: 331.

Bressani, R., D.L. Wilson, M. Behar, M. Chung and M.S. Scrimshaw. 1963. Supplementation of cereals protein with amino acids IV. Lysine supplementation of wheat flour fed to young children at different levels of protein intake in the presence and absence of other amino-acids. J. Nutr. 79: 333.

Duncan, D.B. 1955. Multiple range test and multiple F. Test. Biometrics 11: 1.

Daniel, V.A., T.R. Doraiswamy, S. Venket Rao, M. Swaminathan and H.A.B. Parpia. 1968. Effect of supplementing a poor wheat diet with L. Lysine and DL-threonine on the digestibility co-efficient, biological value and net utilization of protein and nitrogen retention in children. J. Nutr. Dietet 5: 134.

Guggenheim, K. and S. Zmelcman. 1965. Low cost protein source. Protein rich mixture based on vegetable food available in Eastern countries. J. Agri. Food Chem. 13: 148.

Khan, M.A., Riaz-ul-Haq, A.R. Abid and M. Yakoob. 1977. Nutritive value of Maxi-Pak wheat flour supplemented with defatted soyflour. Pak. J. Agri. Sci. 14(1): 69.

Khan, M.A., K. Almas, A.R. Abid and M. Yakoob. 1976-a. The effect of gram flour on the quality of wheat protein. Pak. J. Agri. Sci. 13(2): 167.

Khan, M.A., F. Yasmin, H.M. Chaudhry and A.R. Abid. 1976-b. Supplemen tation of wheat flour with lentil. M.Sc. thesis. Univ. of Agri. Faisalabad

Khathadourian, H.A. 1972. The nutritive value and baking quality of Arabic bread supplemented with chick pea and corn. M.Sc. Thesis. Faculty of Agriculture, University of Beirut, Lebanon.

Mclaren, D.S., R.Y. Asfour J.W. Cowan, P.L. Pellet and R.I. Tannous. 1960. Vegetable as protein sources for infants. 7th Intern. Congr. Nutr. Symp. Hainberg, Germany.

Snedecor, G.W. 1962. Statistical Methods. The Iowa State Univ. Press, Ames. Iowa, U.S.A.

Tannous, R.I., T.Y. Asfour, P.L. Asfour, P.L. Pellet and J.W. Cowan. 1965. Protein rich food mixture for feeding infants in the middle East. Amer. J. Clin. Nutr. 17: 143.