SUMMARY AND CONCLUSIONS

A detailed study of the amino acid composition and its relation to the quality of protein of a number of important groundnut varieties evolved by the Department of Agriculture, Punjab, was undertaken for the 1960 and 1961 crop years. The purpose was to obtain information that might be useful for selection and breeding of a superior protein groundnut variety.

In one experiment, the test samples comprising of nine varieties namely 321/2, 511/28, 145/12-P, 142/16, 69/9, Punjab Groundnut No. 1, 5/10, A 20 and A 22 were collected from four out of six replicated plots. The first seven varieties were spreading type while the remaining two were of erect type. In another experiment samples of 70 strains having different origin and at various stages of evolution, available with the Economic Botanist (Oilseeds), College of Agriculture, Ludhiana, were examined for lysine and methionine contents. All these varieties and strains were grown under similar environmental and agronomic conditions.

Ion-exchange chromatographic method of Moore et al. (1958) was adopted for the determination of all the amino acids except cysteine, cystine, methionine and tryptophan. Cysteine and cystine were determined as cysteic acid after oxidation with performic acid by the method of Schram et al. (1954) as modified by Vervack (1960) using Amberlite IR-120 resin. Methionine and tryptophan were determined by the colorimetric methods of Horn, Jones and Blum (1946) and Steers and Sevag (1949).
Conditions for the standardization of these methods were first established. The reproducibility of the ion-exchange chromatographic method was very good. The fifteen amino acids and ammonia from a model mixture gave an overall recovery of 100.4 ± 4.6 per cent. The overall recovery of these when added to test samples, was 99.3 ± 3.8 per cent. The mean recovery of cysteine + cystine as cysteic acid from amino acid mixture and when added to test sample was 89.4 and 89.0 per cent respectively. The mean recoveries of methionine and tryptophan when added to test samples were 81.4 ± 1.4 per cent and 83.7 ± 2.1 per cent respectively.

The recovery of nitrogen determined in the form of amino acids, ammonia and humin accounted for 97.5 to 99.0 per cent of the total nitrogen of the test samples.

The differences in the mean values for the nitrogen contents of the varieties were found to be statistically significant. Varieties 321/2, 145/12-P, 142/16 and 69/9 were found to contain significantly higher nitrogen contents than rest of the varieties.

The differences in the mean values of serine, glutamic acid, proline, alanine, leucine, tyrosine, phenylalanine, lysine, methionine and cysteine + cystine in varieties were found to be statistically significant while those of aspartic acid, threonine, glycine, valine, isoleucine, histidine, arginine and tryptophan were statistically not significant.

Lysine and methionine contents of seventy strains ranged from 230 mg. to 245 mg. and from 54 mg. to
57 mg. per gram of nitrogen respectively.

The oil content of these strains ranged from 45.0 to 50.6 per cent while the nitrogen content in oil-free meals showed a range of 10.25 to 10.80 per cent. Inverse relationship between the nitrogen and oil contents was found to be highly significant in these strains.

Serine, glutamic acid, proline, tyrosine, lysine and methionine contents of the varieties were found to be inversely correlated with nitrogen contents, while alanine, leucine, phenylalanine and cysteine + cystine were positively correlated with the nitrogen contents. However, none of the correlations reached significant level of 5 per cent probability.

The correlations between some of the amino acid pairs were heterogeneous both in magnitude and direction but only the positive correlations between tyrosine - phenylalanine and methionine - cysteine + cystine were significant at 5 per cent level. The regression coefficients for these pairs of amino acids were found to be $Y = 220.8 + 0.409X$ and $Y = 26.5 + 0.209X$ respectively.

The correlations between nitrogen - lysine and nitrogen - methionine in seventy strains were negative and not significant at 5 per cent level.

The biological value of the varieties were determined by the method of Mitchell (1923-24) by feeding test diets containing 10 per cent proteins to albino rats. The values ranged from 50.9 to 52.8. Biological values were also calculated by chemical score method of Block and Mitchell (1945) and were found to range from 55.4 to 57.4.

The digestibility coefficient of the proteins
contained in different varieties ranged from 81.9 to 83.2.

The PER of three varieties namely 511/28, 5/10, and A 20 representing respectively the lowest, intermediate and the highest contents of methionine and cysteine + cystine were determined by the rat growth method as advocated by Campbell (1961). The average PER values were 1.55, 1.58, and 1.68 of 511/28, 5/10, and A 20 variety respectively.

As the varieties were grown under identical conditions, the intervarietal differences observed in nitrogen and most of the amino acids can be attributed to the genetic differences. Since genetic variations happened to be not so wide the intervarietal differences were not of a high order and hence no corresponding effect of these variations was noticed on the quality of protein of these varieties by biological tests. However, it is possible to predict the biological value of groundnut by determining the methionine content of the sample by calculating the chemical score as reported by Block and Mitchell (1948). The methionine content may be calculated from cysteine + cystine values by using regression coefficient found during this study.

Keeping in view the results of this investigation it is concluded that further extensive studies may be undertaken for the first limiting amino acid methionine in groundnut varieties and strains of very diversified genetic source for locating a strain with high level of methionine in order to bring improvement in the quality of protein by selective breeding. Till then the nutritive value of groundnut may be improved by supplementation with synthetic methionine which is now being manufactured on a large scale and is available at moderate rates.