Onderstepoort Journal of Veterinary Science and Animal Industry, Volume 21, *Number* 1, *March*, 1946.

Printed in the Union of South Africa by the Government Printer, Pretoria.

The Biological Values of the Proteins of Some South African (Whole Seed) Maize Varieties.

By S. J. MYBURGH, Section of Biochemistry and Nutrition, Onderstepoort.

THE importance of maize in the nutrition of farm animals and of human beings in this country makes full information concerning its nutritive value essential. In a recent paper Crawford *et al* (1942) stressed the paucity of our knowledge on the chemical composition of foodstuffs grown under South African conditions and reported amongst other things that the protein content varied from 8·13 to 12·13 for the white types and from 9·25 to 10·84 for the yellow types of whole maize seeds.

The inadequacy of its proteins for growth, that is, its deficiencies in certain essential amino-acids, has long been realised. These deficiencies were shown to be lysine and tryptophane, and Osborne and Mendel (1914) also pointed out that maize proteins were comparatively low in arginine and histidine. They suggested that an improvement may result in maize feeds by increasing the arginine content. Mitchell and Smuts (1932) improved the biological value of whole maize by the supplementation with lysine and tryptophane, and they concluded from these results that lysine was the primary deficiency.

Various workers have shown that the biological value of maize varies at different levels of protein intake. Thus Mitchell *et al* (1924) found an average biological value of 59·6 for rats fed at 10 per cent. protein level and one of 72·0 at 5 per cent. protein level, indicating a lower biological value when the protein level was raised. Similarly Boas-Fixsen (1932) using only 3 rats reported a biological value of 67 for yellow maize fed at an 8 per cent. protein level and one of 84 at a 5 per cent. protein level. Mitchell and Kick (1935) fed maize to pigs at an 8 per cent. protein level and found an average biological value of 54.

Yet another factor which may contribute to variations in the biological values of maize proteins is suggested by the work of Laporta *et al* (1937) who showed that the proteins of the germ of maize differed from those of the rest of the maize seed, a biological value of 60 being obtained for the whole seed as compared with one of only 50 when the germ was removed. Mitchell and Beadles (1944) recently reported a value of 77·6 for the biological value of the germ of maize.

Marais and Smuts (1940) found a biological value of 76 for a specimen of whole white maize as against one of 67 for a yellow variety. Repetition of the test on a second sample of white maize yielded an almost identical figure for the biological value, viz., 75 (unpublished data). Subsequently the writer determined the biological value of a sample of white maize and of one of the yellow varieties from new consignments and found values which were almost the exact reverse of those reported by Marais and Smuts. These findings led to an extension of the work to a number of varieties of maize which were kindly supplied by the Summer Rainfall Cereal Research Station, Kroonstad, Orange Free State, and by the Potchefstroom Agricultural College Farm, and resulted in the abandonment of an idea which took form at the time of the earlier determinations at this station to the effect that the proteins of white maize are necessarily superior to those of yellow maize.

Experimental.

The biological values of the proteins of thirteen varieties of maize were calculated from data obtained in metabolism studies with male rats of the Wistar strain. The method of experimentation, involving the principle of Mitchell (1924), was that described by Marais and Smuts (1940). Eleven of the samples of maize, with protein contents varying between 10 and 12·2 per cent., were obtained, as previously stated, from Kroonstad and Potchefstroom, the remaining two samples, designated M and N, were taken from supplies available in bulk for general feeding purposes on the station. With the exception of one yellow variety (sample G.) the percentage utilization of whose proteins was confirmed in a second trial, the biological value of the proteins of each variety of maize was determined once only with six rats. The low nitrogen period was conducted, prior to the protein period in the case of samples M and N, but following the protein period in the case of all other samples.

Results.

The percentage composition of the experimental rations are given in Tables 1 and 2, whilst the essential results of the several trials are detailed in Tables 3 and 4, and summarized in Table 5. The procedure for the analysis of variance has been applied to the data. The necessary differences for significance between means were found to be 3·442 at $P = \cdot 05$ and 4·578 at $P = \cdot 01$. The statistical significance of the differences among the mean biological values given in Table 5 is indicated in Table 6.

It will be noted from a study of Table 5 that the average biological values of the proteins of the yellow varieties of maize are generally higher than those for the white varieties, even if the values obtained for samples M and N by running the low nitrogen period before the protein period, a procedure which may result in unduly high biological values [Mitchell and Beadles (1937)], are discounted. These results reverse previous impressions in regard to the nutritive value of the proteins of the two classes of maize by showing that the white varieties are not necessarily superior to the yellow varieties.

Marais and Smuts (loc. cit.) thought that variations in the biological values of the proteins of maize may be due to constitutional differences in the protein moieties. An alternative explanation is suggested by the results of Laporta *et al.* and of Mitchell and Beadles, referred to in the introduction to this paper, to the effect that the proteins of the germ of the maize seed

are better balanced in respect of essential amino acids than are those of the rest of the seed. If this be so, then differences in the biological value of the proteins of whole seed may simply result from quantitative differences in the ratio of embryo to endosperm, inherent in different varieties of maize or caused by varying climatic conditions in the course of the development of the seeds. Direct experimentation on this particular aspect of the problem is indicated.

SUMMARY.

1. The biological values of yellow maize and white maize are given for some eleven varieties grown under South African (summer rainfall) conditions.

2. The results indicate that there exists a significant difference in the nutritive value of the proteins of some of these varieties, but that these differences are not associated with the colour of the maize.

ACKNOWLEDGMENT.

The author wishes to record his indebtedness to Dr. J. G. Louw for assistance in the preparation of the manuscript, and to Mr. D. van der Reyden, for advice on the statistical analysis of the results.

LITERATURE.

BOAS-FIXSEN, M. A., AND JACKSON, H. M. (1932). The Biological Values of Protein: IV The Biological Values of the Proteins of Wheat, Maize and Milk. *Biochem. J.*, Vol. 26, p. 1923.

CRAWFORD, D. C., HAMERSMA, P. J., AND MARLOTH, B. W. (1942). The Chemical Composition of some South African Cereals and their Milling Products. *Science Bull.*, No. 20 (Chem. Series No. 171), Dept. of Agric. and Forestry, Union of S.A.

LAPORTA, M. *et al.* (1937). Supplementary value of the proteins of the germ of *Zea Mais* and of *Ficia Faba*. *Quad. Nutrizone*, Vol. 4, pp. 453-466.

MARAIS, J. S. C., AND SMUTS, D. B. (1940). The biological value of the Proteins of Maize and Maize supplemented with Lysine and Tryptophane. *Onderstepoort J.*, Vol. 15, Nos. 1 and 2, p. 197.

MITCHELL, H. H. (1924). A method of determining the Biological Value of Protein. *J. Biol. Chem.*, Vol. 58, pp. 873-903.

MITCHELL, H. H. (1924). The biological value of Proteins at different levels of Intake. *J. Biol. Chem.*, Vol. 58, pp. 905-925.

MITCHELL, H. H., AND SMUTS, D. B. (1932). The Amino-acid deficiencies of Beef, Wheat, Corn, Oats and Soybeans for growth in the White Rat. *J. Biol. Chem.*, Vol. 95, pp. 263-281.

MITCHELL, H. H., AND KICK, C. H. (1935). The supplementary relation between the Proteins of Corn and Tankage determined by metabolism experiments on Swine. *J. Agric. Res.*, Vol. 35, p. 857.

MITCHELL, H. H. AND BEADLES, J. (1944). Corn Germ: a Valuable Protein food *Science*. Vol. 99 (2563), p. 129.

MITCHELL, H. H. AND BEADLES (1937). The Nutritive Value of the Proteins of Nuts in comparison with the Nutritive Value of Beef Proteins. *J. Nutrition*, Vol. 14 p. 597.

OSBORNE, T. B., AND MENDEL, L. B. (1914). Amino-acids in Nutrition and Growth. *J. Biol. Chem.*, Vol. 17, p. 325.

OSBORNE, T. B., AND MENDEL, L. B. (1914). Nutritive properties of Proteins of the Maize Kernel. *J. Biol. Chem.*, Vol. 18, p. 1.

TABLE 1.

Percentage Composition of the Rations.

Ingredients.	N-Low.	Whole Yellow Maize M.	Whole White Maize N.	Remarks.
Whole Yellow Maize M(Commercial type)	—	80·0	—	1. Whole egg was dried on the steam bath and ether extracted.
Whole White Maize N(Commercial Type)	—	—	83·3	2. Butterfat was prepared from butter, after filtration of the heat-coagulated casein.
Whole Egg	3·8	—	—	
Sucrose	10·0	5·0	1·7	3. Harris yeast concentrate. Prepared by the Harris Laboratory, Tuckahoe, New York.
Butterfat	8·0	8·0	8·0	
Harris Yeast	2·0	2·0	2·0	
Cod Liver Oil	2·0	2·0	2·0	4. Hubbel Salt Mixture—see Hubbel *et al.* (1937), *J. Nutrition*, Vol. 14 p. 273.
Salt mixture	2·0	2·0	2·0	
Dextrinized Starch	69·2	—	—	
NaCl	1·0	1·0	1·0	
Agar	2·0	—	—	
Total	100·0	100·0	100·0	
Percentage N	0·60	1·267	1·290	

Table 2.

Percentage Composition of the Rations.

Ingredients.	N-Low.	Whole Yellow Maize. A.	Whole Yellow Maize. B.	Whole Yellow Maize. C.	Whole Yellow Maize. D.	Whole Yellow Maize. E.	Whole Yellow Maize. F.	Whole Yellow Maize. G.	Whole Yellow Maize. G1	Whole White Maize. H.	Whole White Maize. J.	Whole White Maize. K.	Whole White Maize. L.
A variety "Eksteen"	—	71·0	—	—	—	—	—	—	—	—	—	—	—
B Variety "Blits"	—	—	64·6	—	—	—	—	—	—	—	—	—	—
C Variety "Robyn"	—	—	—	70·0	—	—	—	—	—	—	—	—	—
D Variety "Hotnot"	—	—	—	—	64·2	—	—	—	—	—	—	—	—
E Variety "Sahara"	—	—	—	—	—	72·9	—	—	—	—	—	—	—
F Variety "Peruvian"	—	—	—	—	—	—	73·7	—	—	—	—	—	—
G Commercial Type	—	—	—	—	—	—	—	77·8	—	—	—	—	—
G1 Same as G	—	—	—	—	—	—	—	—	77·8	—	—	—	—
H Variety "American Flint"	—	—	—	—	—	—	—	—	—	74·2	—	—	—
J Variety "Anveld"	—	—	—	—	—	—	—	—	—	—	70·7	—	—
K Variety "Hickory King"	—	—	—	—	—	—	—	—	—	—	—	70·4	—
L Variety "Potchefstroom Pearl"	—	—	—	—	—	—	—	—	—	—	—	—	69·0
Whole Egg	3·8	—	—	—	—	—	—	—	—	—	—	—	—
Sucrose	10·0	12·0	18·4	13·0	18·8	10·1	9·3	7·2	7·2	8·8	12·3	12·6	14·0
Butterfat	8·0	8·0	8·0	8·0	8·0	8·0	8·0	8·0	8·0	8·0	8·0	8·0	8·0
Harris Yeast	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0
Cod Liver Oil	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0
Hubbel Salt Mixture	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0	2·0
Dextrinized Starch	69·2	—	—	—	—	—	—	—	—	—	—	—	—
NaCl	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0	1·0
Agar	2·0	2·0	2·0	2·0	2·0	2·0	2·0	—	—	2·0	2·0	2·0	2·0
Total	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0	100·0
Percentage N	0·60	1·210	1·280	1·295	1·330	1·310	1·375	1·270	1·288	1·270	1·220	1·293	1·291

Remarks.—1. Whole egg was dried on water-bath and ether extracted.

2. Butterfat was prepared from butter by filtering off the heat-precipitated casein.

3. Harris Yeast Concentrate—The Harris Laboratory, Tuckahoe, New York.

4. Hubbel Salt Mixture—Hubbel *et al*, *J. Nutrition* (1937), Vol. 14, p. 273.

TABLE 3.

Nitrogen Metabolism Data—Calculation of the Biological Value.

Rat No.	Initial Weight.	Final Weight.	Average Weight.	Daily Food Intake.	Daily N Intake.	Daily Faecal N.	Metabolic N.		Food N in Faeces.	Absorbed N.	Daily Urinary N.	Endogenous N.		Food N in Urine.	Retained N.	N-Balance.	Apparent Digestibility.	True Digestibility.	Biological Value.	Percentage Nett N-Utilization.
							Per Gm. Food.	Per Day.				Per 100 Gm. Weight.	Per Day.							
N-low Period.																				
	gm.	gm.	gm.	gm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.				
54	157	159	158	10·5	—	25·9	2·46	—	—	—	19·1	12·1	—	—	—	—	—	—	—	—
55	169	162	166	9·0	—	23·8	2·65	—	—	—	17·8	10·7	—	—	—	—	—	—	—	—
56	167	167	167	10·0	—	22·4	2·24	—	—	—	19·6	11·7	—	—	—	—	—	—	—	—
57	161	161	161	9·9	—	17·8	1·80	—	—	—	19·5	12·1	—	—	—	—	—	—	—	—
58	160	156	158	8·8	—	20·9	2·37	—	—	—	19·9	12·6	—	—	—	—	—	—	—	—
59	170	174	172	10·3	—	25·8	2·50	—	—	—	18·1	10·5	—	—	—	—	—	—	—	—
Whole White Maize (N) Period (N = 1·29 per cent.)																				
54	163	164	164	10·5	135·4	24·0	2·46	25·82	−1·82	135·4	73·0	12·1	19·8	53·2	82·2	+38·4	82	100	60·7	60·7
55	152	152	152	9·0	116·0	19·5	2·65	23·88	−4·38	116·0	60·1	10·7	16·2	43·9	72·1	+36·4	83	100	62·2	62·2
56	173	173	173	10·0	129·0	24·0	2·24	22·40	+1·60	127·4	54·9	11·7	20·2	34·7	92·7	+49·1	82	99	72·7	72·0
57	161	165	163	9·9	127·8	23·6	1·80	17·80	+5·80	122·0	59·3	12·1	19·7	39·6	82·4	+44·9	82	96	67·6	65·0
58	159	160	160	9·5	122·5	22·2	2·37	22·50	−0·30	122·5	50·0	12·6	20·2	29·8	92·7	+50·3	84	100	75·7	75·7
59	174	178	176	10·4	134·1	26·0	2·50	26·00	0	134·1	64·9	10·5	18·5	46·4	87·7	+43·2	81	100	65·5	65·5
														AVERAGE.....			82	99	67·4	66·8

TABLE 3—(*continued*).

Rat No.	Initial Weight.	Final Weight.	Average Weight.	Daily Food Intake.	Daily N Intake.	Daily Faecal N.	Metabolic N.		Food N in Faeces.	Absorbed N.	Daily Urinary N.	Endogenous N.		Food N in Urine.	Retained N.	N-Balance.	Apparent Digestibility.	True Digestibility.	Biological Value.	Percentage Nett N-Utilization.
							Per Gm. Food.	Per Day.				Per 100 Gm. Weight.	Per Day.							
									N-low Period.											
	gm.	gm.	gm.	gm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.				
48	177	180	179	10·7	—	24·4	2·28	—	—	—	23·6	13·2	—	—	—	—	—	—	—	—
49	183	186	185	10·6	—	23·1	2·18	—	—	—	23·0	12·4	—	—	—	—	—	—	—	—
50	164	162	163	8·7	—	20·3	2·34	—	—	—	25·4	15·6	—	—	—	—	—	—	—	—
51	180	177	179	9·7	—	23·3	2·40	—	—	—	24·1	13·5	—	—	—	—	—	—	—	—
52	170	169	170	10·0	—	20·2	2·02	—	—	—	19·5	11·5	—	—	—	—	—	—	—	—
53	164	162	163	9·7	—	21·2	2·19	—	—	—	23·8	14·6	—	—	—	—	—	—	—	—
									Whole Yellow Maize (M) Period (N – 1·267 per cent.).											
48	186	194	190	11·0	139·4	27·4	2·28	25·1	+2·3	137·2	64·0	13·2	25·1	38·9	98·3	+48·0	80	98	71·6	70·2
49	190	198	194	10·5	133·3	26·9	2·18	22·9	+4·0	129·3	60·0	12·4	24·1	35·9	93·4	+46·4	80	97	72·2	70·0
50	169	175	172	9·0	114·0	22·6	2·34	21·1	+1·5	112·5	45·5	15·6	26·8	18·7	93·8	+45·9	80	99	83·5	82·6
51	181	190	186	10·0	126·7	23·7	2·40	24·0	−0·3	126·7	58·8	13·5	25·1	33·7	93·0	+44·2	81	100	73·4	73·4
52	177	182	180	9·9	125·5	24·6	2·02	20·0	+4·6	120·9	53·0	11·5	20·7	32·3	88·6	+47·9	80	96	73·4	70·5
53	169	178	174	10·0	126·7	25·2	2·19	21·9	+3·3	123·4	55·7	14·6	25·4	30·3	93·1	+45·8	79	97	75·5	73·2
														AVERAGE.....			80	98	74·9	73·3

TABLE 4.

Nitrogen Metabolism Data—Calculation of the Biological Value.

Rat No.	Initial Weight.	Final Weight.	Average Weight.	Daily Food Intake.	Daily N Intake.	Daily Faecal N.	Metabolic N.		Food N in Faeces.	Absorbed N.	Daily Urinary N.	Endogenous N.		Food N in Ufine.	Retained N.	N-Balance.	Apparent Digestibility.	True Digestibility.	Biological Value.	Percentage Nett N-Utilization.
							Per Gm. Food.	Per Day.				Per 100 Gm. Weight.	Per Day.							
Whole Yellow Maize (A)—"Eksteen"—Period (N = 1·21 per cent.).																				
	gm.	gm.	gm.	gm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.				
1	77	77	77	6·0	72·6	14·8	2·03	12·2	+2·6	70·0	38·6	22·6	17·4	21·2	48·8	+19·2	79·6	96·4	69·8	67·2
2	80	78	79	5·9	71·4	12·2	1·63	9·6	+2·6	68·8	38·2	16·6	13·1	25·1	43·7	+21·0	82·8	96·4	63·5	61·3
3	71	71	71	5·5	65·4	10·4	2·00	11·0	−0·6	65·4	33·8	21·2	15·0	18·8	46·6	+21·2	82·5	100	71·2	71·2
4	80	81	81	6·0	72·6	9·8	1·69	10·1	−0·3	72·6	34·9	19·7	15·9	19·0	53·6	+27·9	86·4	100	73·8	73·8
5	95	95	95	7·0	84·7	13·2	2·20	15·4	−2·2	84·7	43·4	21·0	19·0	24·4	60·3	+28·1	84·5	100	71·2	71·2
6	74	77	76	5·9	71·4	11·0	1·93	11·4	−0·4	71·4	35·8	18·7	14·2	21·6	49·8	+24·6	69·8	100	69·8	69·8
																Average.....	83	99	69·9	69·1
N-low Period.																				
1	76	75	76	6·0	—	12·2	2·03	—	—	—	17·2	22·6	—	—	—	—	—	—	—	—
2	81	82	82	6·0	—	9·8	1·63	—	—	—	13·6	16·6	—	—	—	—	—	—	—	—
3	66	68	67	5·6	—	11·2	2·00	—	—	—	14·2	21·2	—	—	—	—	—	—	—	—
4	77	78	78	6·5	—	11·0	1·69	—	—	—	15·4	19·7	—	—	—	—	—	—	—	—
5	92	93	93	7·0	—	15·4	2·20	—	—	—	19·5	21·0	—	—	—	—	—	—	—	—
6	77	79	78	6·0	—	11·6	1·93	—	—	—	14·6	18·7	—	—	—	—	—	—	—	—

TABLE 4—(*continued*).

Rat No.	Initial Weight.	Final Weight.	Average Weight.	Daily Food Intake.	Daily N Intake.	Daily Faecal N.	Metabolic N.		Food N in Faeces.	Absorbed N.	Daily Urinary N.	Endogenous N.		Food N in Urine.	Retained N.	N-Balance.	Apparent Digestibility.	True Digestibility.	Biological Value.	Percentage Nett N-Utilization.
							Per Gm. Food.	Per Day.				Per 100 Gm. Weight.	Per Day.							
Whole Yellow Maize (B)—"Blits"—Period (N = 1·28 per cent.).																				
	gm.	gm.	gm.	gm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.				
7	77	75	76	6·0	76·8	16·5	1·97	11·8	+4·7	72·1	39·8	21·3	16·2	23·6	48·5	+20·5	78·5	94·0	67·2	63·2
8	75	75	75	5·5	70·4	11·0	2·07	11·4	−0·4	70·4	34·2	18·7	14·0	20·2	50·2	+25·2	84·5	100·0	71·3	71·3
9	76	77	77	5·6	71·7	10·2	2·47	13·8	−3·6	71·7	34·1	19·8	14·3	18·8	52·9	+27·4	85·8	100·0	73·8	73·8
10	81	79	80	6·5	83·2	11·2	1·81	11·8	−0·6	83·2	38·2	17·7	14·2	24·0	59·2	+33·8	86·5	100·0	71·2	71·2
11	75	75	75	6·0	76·8	11·6	1·87	11·2	+0·4	76·4	34·9	18·7	14·2	20·7	55·7	+30·3	85·0	99·5	72·9	72·5
12	88	89	89	7·0	89·5	17·4	1·81	12·6	+4·8	84·7	48·3	18·4	16·4	31·9	52·8	+23·8	80·6	94·7	62·4	59·1
																AVERAGE.....	83	98	69·8	68·5
N-low Period.																				
7	73	74	74	6·0	—	11·8	1·97	—	—	—	15·8	21·3	—	—	—	—	—	—	—	—
8	76	75	76	6·0	—	12·4	2·07	—	—	—	14·2	18·7	—	—	—	—	—	—	—	—
9	77	78	78	6·0	—	14·8	2·47	—	—	—	15·5	19·8	—	—	—	—	—	—	—	—
10	77	82	80	6·5	—	11·8	1·81	—	—	—	14·2	17·7	—	—	—	—	—	—	—	—
11	75	76	76	6·0	—	11·2	1·87	—	—	—	14·2	18·7	—	—	—	—	—	—	—	—
12	86	87	87	6·5	—	11·8	1·81	—	—	—	16·0	18·4	—	—	—	—	—	—	—	—

TABLE 4—(*continued*).

Rat No.	Initial Weight.	Final Weight.	Average Weight.	Daily Food Intake.	Daily N Intake.	Daily Faecal N.	Metabolic N.		Food N in Faeces.	Absorbed N.	Daily Urinary N.	Endogenous N.		Food N in Urine.	Retained N.	N-Balance.	Apparent Digestibility.	True Digestibility.	Biological Value.	Percentage Nett N-Utilization.
							Per Gm. Food.	Per Day.				Per 100 Gm. Weight.	Per Day.							
Whole Yellow Maize (C)—"Robyn"—Period (N = 1·295 per cent.).																				
	gm.	gm.	gm.	gm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.				
13	102	107	105	7·0	90·6	12·8	1·86	13·0	−0·2	90·6	50·3	13·1	13·8	36·5	54·1	+27·5	84·8	100·0	59·7	59·7
14	92	96	94	7·0	90·6	16·8	1·81	12·6	+4·2	86·4	49·6	15·9	15·0	34·6	51·8	+24·2	81·5	95·4	60·0	57·2
15	99	106	103	7·0	90·6	12·6	2·14	15·0	−2·4	90·6	48·0	12·3	12·7	35·3	55·3	+29·3	86·0	100·0	61·0	61·0
16	99	102	101	7·0	90·6	13·0	1·57	11·0	+2·0	88·6	48·7	15·3	15·5	33·2	55·4	+26·9	83·5	95·6	62·6	59·9
17	87	93	90	6·5	84·2	13·6	1·90	12·4	+1·2	83·0	46·5	12·8	11·5	35·0	48·0	+24·1	84·0	98·6	58·0	57·2
18	104	108	106	7·0	90·6	12·0	1·97	13·8	−1·8	90·6	48·0	12·2	12·9	35·1	55·5	+30·6	86·8	100·0	61·2	61·2
																AVERAGE.....	84·4	98·3	60·4	59·4
N-low Period.																				
13	106	105	106	7·0	—	13·0	1·86	—	—	—	13·85	13·1	—	—	—	—	—	—	—	—
14	95	99	97	6·5	—	11·8	1·81	—	—	—	15·4	15·9	—	—	—	—	—	—	—	—
15	103	103	103	7·0	—	15·0	2·14	—	—	—	12·6	12·3	—	—	—	—	—	—	—	—
16	101	104	103	7·0	—	10·96	1·57	—	—	—	15·8	15·3	—	—	—	—	—	—	—	—
17	92	91	92	6·0	—	11·4	1·90	—	—	—	11·8	12·8	—	—	—	—	—	—	—	—
18	105	108	107	7·0	—	13·8	1·97	—	—	—	13·0	12·2	—	—	—	—	—	—	—	—

TABLE 4—(*continued*).

Rat No.	Initial Weight.	Final Weight.	Average Weight.	Daily Food Intake.	Daily N Intake.	Daily Faecal N.	Metabolic N. Per Gm. Food.	Metabolic N. Per Day.	Food N in Faeces.	Absorbed N.	Daily Urinary N.	Endogenous N. Per 100 Gm. Weight.	Endogenous N. Per Day.	Food N in Urine.	Retained N.	N-Balance.	Apparent Digestibility.	True Digestibility.	Biological Value.	Percentage Nett N-Utilization.
Whole Yellow Maize (D)—"Hotnot"—Period (N=1·33 per cent.).																				
	gm.	gm.	gm.	gm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.				
19	94	99	97	7·0	93·1	15·8	1·83	12·8	+3·0	90·1	55·6	12·9	12·5	43·1	57·0	+21·7	83·0	97·0	63·3	61·4
20	107	111	109	7·0	93·1	18·3	2·28	16·0	+2·3	90·3	52·0	15·9	17·3	34·7	56·1	+22·8	80·4	97·6	61·8	60·2
21	107	110	109	7·0	93·1	16·4	1·71	12·0	+4·4	88·7	53·6	15·6	17·0	36·6	52·1	+23·1	82·4	95·2	59·0	56·2
22	101	108	105	7·0	93·1	18·1	1·71	12·0	+6·1	87·0	50·0	15·4	16·2	33·8	53·2	+25·0	80·6	93·4	61·1	57·0
23	92	98	95	7·0	93·1	15·8	2·03	14·2	+1·6	91·5	46·0	13·6	12·9	33·1	58·4	+21·3	83·0	98·2	53·8	62·6
24	104	106	105	7·0	93·1	15·8	1·63	11·4	+4·4	88·7	56·0	18·7	19·6	36·4	52·3	+21·3	83·0	95·2	59·0	56·2
																AVERAGE.....	82·1	96·1	61·3	58·9
N-low Period.																				
19	96	99	98	7·0	—	12·8	1·83	—	—	—	12·6	12·9	—	—	—	—	—	—	—	—
20	108	106	107	6·5	—	14·8	2·28	—	—	—	17·0	15·9	—	—	—	—	—	—	—	—
21	107	110	109	7·0	—	12·0	1·71	—	—	—	17·0	15·6	—	—	—	—	—	—	—	—
22	102	97	100	6·0	—	10·17	1·71	—	—	—	15·43	15·4	—	—	—	—	—	—	—	—
23	93	93	93	6·5	—	13·2	2·03	—	—	—	12·6	13·6	—	—	—	—	—	—	—	—
24	106	103	104	7·0	—	11·36	1·63	—	—	—	19·5	18·7	—	—	—	—	—	—	—	—

TABLE 4—(*continued*).

Rat No.	Initial Weight.	Final Weight.	Average Weight.	Daily Food Intake.	Daily N Intake.	Daily Faecal N.	Metabolic N.		Food N in Faeces.	Absorbed N.	Daily Urinary N.	Endogenous N.		Food N in Urine.	Retained N.	N-Balance.	Apparent Digestibility.	True Digestibility.	Biological Value.	Percentage Nett N-Utilization.
							Per Gm. Food.	Per Day.				Per 100 Gm. Weight.	Per Day.							
Whole Yellow Maize (E)—"Sahara"—Period (N = 1·31 per cent.).																				
	gm.	gm.	gm.	gm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.				
25	154	157	156	8·4	110·0	18·5	2·40	20·2	−1·7	110·0	66·1	11·4	17·8	48·3	61·7	+25·4	83	100	56·1	56·1
26	146	149	148	7·0	91·7	19·3	2·37	15·9	+3·4	88·3	52·0	13·2	19·5	32·5	55·8	+20·4	79	96	63·2	60·7
27	152	152	152	7·1	93·0	17·1	2·09	14·85	+2·25	90·75	57·3	13·4	20·4	36·9	53·8	+18·6	82	98	59·4	58·2
28	164	169	167	8·4	110·0	18·9	2·09	17·55	+1·35	108·6	65·0	12·7	21·4	43·6	65·0	+16·1	83	99	59·9	59·3
29	151	161	156	8·4	110·0	19·7	2·31	19·4	+0·3	109·7	61·3	12·4	19·3	42·0	67·7	+29·0	82	100	61·6	61·6
30	154	155	155	8·4	110·0	18·5	2·09	17·6	+0·9	109·1	65·4	11·5	17·8	47·6	61·5	+26·1	83	99	56·4	55·8
														AVERAGE.....			82	98	59·3	58·6
N-low Period.																				
25	150	146	148	8·0	—	19·15	2·40	—	—	—	16·9	11·4	—	—	—	—	—	—	—	—
26	142	142	142	7·5	—	17·75	2·37	—	—	—	18·75	13·2	—	—	—	—	—	—	—	—
27	144	144	144	8·5	—	17·75	2·09	—	—	—	19·4	13·4	—	—	—	—	—	—	—	—
28	153	158	156	8·5	—	17·75	2·09	—	—	—	19·8	12·7	—	—	—	—	—	—	—	—
29	151	151	151	8·0	—	18·5	2·31	—	—	—	18·75	12·4	—	—	—	—	—	—	—	—
30	142	145	144	7·5	—	15·7	2·09	—	—	—	16·5	11·5	—	—	—	—	—	—	—	—

TABLE 4—(*continued*).

Rat No.	Initial Weight.	Final Weight.	Average Weight.	Daily Food Intake.	Daily N Intake.	Daily Faecal N.	Metabolic N. Per Gm. Food.	Metabolic N. Per Day.	Food N in Faeces.	Absorbed N.	Daily Urinary N.	Endogenous N. Per 100 Gm. Weight.	Endogenous N. Per Day.	Food N in Urine.	Retained N.	N-Balance.	Apparent Digestibility.	True Digestibility.	Biological Value.	Percentage Nett N-Utilization.
Whole Yellow Maize (F)—"Peruvian"—Period (N = 1·375 per cent.).																				
	gm.	gm.	gm.	gm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.				
31	123	133	128	8·5	117·0	14·85	1·95	16·6	−1·75	117·0	68·2	12·7	16·3	51·9	65·1	+33·9	87·4	100	56·6	56·6
32	114	120	117	8·0	110·0	15·05	1·74	13·9	+1·15	108·8	57·7	15·2	17·8	39·9	68·9	+37·1	86·2	99	63·4	62·8
33	124	124	124	7·3	86·6	13·0	1·92	12·1	+0·9	85·7	50·5	12·8	15·9	34·6	51·1	+23·1	85·0	99	59·6	59·0
34	116	120	118	8·0	110·0	15·2	1·97	15·8	−0·6	110·0	66·0	14·9	17·6	48·4	61·6	+28·8	86·4	100	56·0	56·0
35	104	109	107	7·5	103·0	15·6	1·74	13·1	+2·5	100·5	55·5	14·5	15·5	40·0	60·5	+31·9	85·0	98	57·6	56·4
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
														AVERAGE.....			86	99	58·6	58·2
N-low Period.																				
31	132	137	135	7·1	—	13·8	1·95	—	—	—	17·1	12·7	—	—	—	—	—	—	—	—
32	110	115	113	7·0	—	12·2	1·74	—	—	—	17·1	15·2	—	—	—	—	—	—	—	—
33	124	129	127	7·5	—	14·4	1·92	—	—	—	16·3	12·8	—	—	—	—	—	—	—	—
34	120	129	125	7·5	—	14·8	1·97	—	—	—	18·6	14·9	—	—	—	—	—	—	—	—
35	106	110	108	7·0	—	12·2	1·74	—	—	—	15·7	14·5	—	—	—	—	—	—	—	—
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

TABLE 4—(*continued*).

Rat No.	Initial Weight.	Final Weight.	Average Weight.	Daily Food Intake.	Daily N Intake.	Daily Faecal N.	Metabolic N.		Food N in Faeces.	Absorbed N.	Daily Urinary N.	Endogenous N.		Food N in Urine.	Retained N.	N-Balance.	Apparent Digestibility.	True Digestibility.	Biological Value.	Percentage Nett N-Utilization.
							Per Gm. Food.	Per Day.				Per 100 Gm. Weight.	Per Day.							
Whole Yellow Maize (G) Period (N = 1·288 per cent.).																				
	gm.	gm.	gm.	gm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.				
36	91	100	96	10·9	140·4	26·1	2·35	25·7	+0·4	140·0	71·0	18·3	17·6	53·4	86·6	+43·3	81	97	61·9	60·0
37	95	103	99	10·9	140·4	26·3	2·57	28·0	−1·7	149·4	72·6	17·7	17·5	55·1	85·3	+41·5	81	100	60·8	60·8
38	93	103	98	9·3	119·6	20·6	2·62	24·3	−3·7	119·6	70·4	18·0	16·8	53·6	66·0	+28·6	83	100	55·2	55·2
39	100	106	103	9·7	124·9	22·2	2·52	24·4	−2·2	124·9	68·7	17·3	17·8	50·9	74·0	+34·0	82	100	59·2	59·2
40	87	97	92	10·0	128·8	21·4	2·53	25·3	−3·9	128·8	72·0	18·3	16·9	55·1	73·7	+35·4	83	100	57·2	57·2
41	86	91	89	9·8	126·2	23·5	2·74	26·8	−3·3	126·2	68·9	16·7	14·9	54·0	72·2	+33·8	81	100	57·2	57·2
														AVERAGE.....			82	99	58·6	58·3
N-low Period.																				
36	101	107	104	9·9	—	23·3	2·35	—	—	—	19·0	18·3	—	—	—	—	—	—	—	—
37	105	112	109	9·8	—	25·3	2·57	—	—	—	19·2	17·7	—	—	—	—	—	—	—	—
38	106	110	108	7·4	—	19·4	2·62	—	—	—	19·4	18·0	—	—	—	—	—	—	—	—
39	106	110	108	7·7	—	19·4	2·52	—	—	—	18·7	17·3	—	—	—	—	—	—	—	—
40	95	100	98	7·5	—	19·0	2·53	—	—	—	17·9	18·3	—	—	—	—	—	—	—	—
41	93	96	95	7·3	—	20·0	2·74	—	—	—	15·9	16·7	—	—	—	—	—	—	—	—

TABLE 4—(*continued*).

Rat No.	Initial Weight.	Final Weight.	Average Weight.	Daily Food Intake.	Daily N Intake.	Daily Faecal N.	Metabolic N.		Food N in Faeces.	Absorbed N.	Daily Urinary N.	Endogenous N.		Food N in Urine.	Retained N.	N-Balance.	Apparent Digestibility.	True Digestibility.	Biological Value.	Percentage Nett N-Utilization.
							Per Gm. Food.	Per Day.				Per 100 Gm. Weight.	Per Day.							
Whole Yellow Maize (G.1) Period (N = 1·270 per cent.).																				
	gm.	gm.	gm.	gm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.				
42	140	141	141	9·5	120·6	21·85	2·40	22·8	−0·95	120·6	70·8	11·4	16·1	54·7	65·9	+27·9	81	100	54·5	54·5
43	140	147	144	9·5	120·6	21·05	2·37	22·5	−1·45	120·6	63·0	13·2	19·0	44·0	76·6	+36·5	82	100	63·5	63·5
44	135	140	138	9·5	120·6	18·56	2·09	19·9	−1·34	120·6	70·0	13·4	18·5	51·5	69·1	−32·0	85	100	57·3	57·3
45	138	147	143	9·7	123·0	20·4	2·09	20·3	+0·1	122·9	68·8	12·7	18·1	50·7	72·2	+33·8	83	100	58·7	58·7
46	144	149	149	10·1	128·1	21·85	2·31	23·4	−1·55	128·1	70·8	12·4	18·5	52·3	75·8	+35·4	83	100	59·2	59·2
47	130	138	134	9·1	115·5	22·5	2·09	19·0	+3·5	112·0	63·0	11·5	15·4	47·6	64·4	+30·0	80	98	57·6	56·4
																AVERAGE.....	82	100	58·5	58·3
N-low Period.																				
42	150	146	148	8·0	—	19·15	2·40	—	—	—	16·9	11·4	—	—	—	—	—	—	—	—
43	142	142	142	7·5	—	17·75	2·37	—	—	—	18·75	13·2	—	—	—	—	—	—	—	—
44	144	144	144	8·5	—	17·75	2·09	—	—	—	19·4	13·4	—	—	—	—	—	—	—	—
45	153	158	156	8·5	—	17·75	2·09	—	—	—	19·8	12·7	—	—	—	—	—	—	—	—
46	151	151	151	8·0	—	18·5	2·31	—	—	—	18·75	12·4	—	—	—	—	—	—	—	—
47	142	145	144	7·5	—	15·7	2·09	—	—	—	16·5	11·5	—	—	—	—	—	—	—	—

TABLE 4—(*continued*).

Rat No.	Initial Weight.	Final Weight.	Average Weight.	Daily Food Intake.	Daily N Intake.	Daily Faecal N.	Metabolic N. Per Gm. Food.	Metabolic N. Per Day.	Food N in Faeces.	Absorbed N.	Daily Urinary N.	Endogenous N. Per 100 Gm. Weight.	Endogenous N. Per Day.	Food N in Urine.	Retained N.	N-Balance.	Apparent Digestibility.	True Digestibility.	Biological Value.	Percentage Nett N-Utilization.
Whole White Maize (H)—"American Flint"—Period (N = 1·270 per cent.).																				
	gm.	gm.	gm.	gm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.				
78	90	92	91	7·0	88·9	16·0	2·00	14·0	+2·0	86·9	56·3	24·5	22·3	34·0	52·9	+16·6	82·0	96·6	60·9	58·8
79	104	105	105	8·0	101·6	18·7	2·36	18·9	−0·2	101·6	63·4	21·9	23·0	40·4	61·2	+19·5	81·0	100·0	60·3	60·3
80	94	99	97	7·5	95·2	16·8	2·15	16·1	+0·7	94·5	53·2	20·2	19·6	33·6	60·9	+25·2	82·3	99·3	64·4	64·0
81	112	116	114	9·0	114·4	20·4	2·36	21·2	−0·8	112·2	63·1	19·0	21·7	41·4	70·8	+30·9	82·2	100·0	63·1	63·1
82	103	107	104	8·0	101·6	20·5	2·31	18·5	+2·0	99·6	64·3	18·0	18·7	45·6	54·0	+16·8	80·0	98·0	54·3	53·2
83	107	111	109	8·5	108	21·7	2·44	20·8	+0·9	107·1	64·0	18·7	20·4	43·6	63·5	+22·3	80·0	99·1	59·3	58·7
														AVERAGE.....			81	99	60·4	59·7
N-low Period.																				
78	91	93	92	7·5	—	14·95	2·00	—	—	—	22·6	24·5	—	—	—	—	—	—	—	—
79	102	105	104	8·5	—	20·1	2·36	—	—	—	22·8	21·9	—	—	—	—	—	—	—	—
80	97	99	98	7·5	—	16·1	2·15	—	—	—	19·8	20·2	—	—	—	—	—	—	—	—
81	155	115	115	8·0	—	18·9	2·36	—	—	—	21·9	19·0	—	—	—	—	—	—	—	—
82	106	110	108	8·0	—	18·5	2·31	—	—	—	19·4	18·0	—	—	—	—	—	—	—	—
83	109	110	110	8·0	—	19·5	2·44	—	—	—	20·6	18·7	—	—	—	—	—	—	—	—

TABLE 4—(*continued*).

Rat No.	Initial Weight.	Final Weight.	Average Weight.	Daily Food Intake.	Daily N Intake.	Daily Faecal N.	Metabolic N.		Food N in Faeces.	Absorbed N.	Daily Urinary N.	Endogenous N.		Food N in Urine.	Retained N.	N-Balance.	Apparent Digestibility.	True Digestibility.	Biological Value.	Percentage Nett N-Utilization.
							Per Gm. Food.	Per Day.				Per 100 Gm. Weight.	Per Day.							
Whole White Maize (J)—"Anveld"—Period (N = 1·22 per cent.).																				
	gm.	gm.	gm.	gm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.			
84	84	87	86	7·0	85·4	14·3	2·19	15·3	−1·0	85·4	56·8	21·6	18·6	38·2	47·2	+14·3	83·3	100	55·3	55·3
85	86	90	88	7·0	85·4	13·2	2·67	18·7	−6·6	85·4	58·8	20·2	17·8	41·0	44·4	+13·4	84·6	100	52·1	52·1
86	85	90	88	7·0	85·4	13·8	2·64	18·5	−5·5	85·5	56·3	20·4	18·1	38·2	47·2	+15·3	83·8	100	55·3	55·3
87	87	91	89	7·0	85·4	14·7	2·25	16·8	−1·1	85·4	56·9	23·4	20·8	36·1	49·3	+13·8	82·8	100	57·7	57·7
88	72	75	74	6·0	73·2	11·3	2·33	14·0	−2·7	73·2	47·1	22·8	16·9	30·2	43·0	+14·8	86·0	100	58·7	58·7
89	65	69	67	6·0	73·2	14·9	2·37	14·2	+0·7	72·5	48·2	22·4	15·0	33·2	39·3	+10·1	79·8	99	54·2	53·7
															AVERAGE.....		83	100	55·5	55·5
N-low Period.																				
84	88	91	90	7·0	—	15·3	2·19	—	—	—	19·4	21·6	—	—	—	—	—	—	—	—
85	90	92	91	7·0	—	18·7	2·67	—	—	—	18·3	20·2	—	—	—	—	—	—	—	—
86	94	96	95	7·0	—	18·5	2·64	—	—	—	19·4	20·4	—	—	—	—	—	—	—	—
87	90	91	91	7·5	—	16·9	2·25	—	—	—	21·3	23·4	—	—	—	—	—	—	—	—
88	74	74	74	6·0	—	14·0	2·33	—	—	—	16·9	22·8	—	—	—	—	—	—	—	—
89	67	69	68	6·5	—	15·1	2·37	—	—	—	15·2	22·4	—	—	—	—	—	—	—	—

TABLE 4—(*continued*).

Rat No.	Initial Weight.	Final Weight.	Average Weight.	Daily Food Intake.	Daily N Intake.	Daily Faecal N.	Metabolic N.		Food N in Faeces.	Absorbed N.	Daily Urinary N.	Endogenous N.		Food N in Urine.	Retained N.	N-Balance.	Apparent Digestibility.	True Digestibility.	Biological Value.	Percentage Nett N-Utilization.
							Per Gm. Food.	Per Day.				Per 100 Gm. Weight.	Per Day.							
Whole White Maize (K)—"Hickory King"—Period (N=1·293 per cent.).																				
	gm.	gm.	gm.	gm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.	mgm.				
90	108	110	109	7·5	97·0	22·2	2·20	21·3	+0·9	96·1	62·2	23·7	25·8	36·4	59·7	+12·6	77·1	99·0	62·1	61·4
91	115	120	118	8·5	110·0	21·8	2·24	19·1	+2·7	107·3	72·8	22·8	26·9	45·9	61·4	+15·4	80·2	98·6	57·3	56·5
92	112	115	114	8·5	110·0	20·0	2·33	19·8	+0·2	109·8	70·0	19·7	22·5	47·5	62·3	+20·0	81·9	99·8	56·8	56·7
93	97	99	98	7·0	90·6	17·2	2·33	16·3	+0·9	89·7	54·1	21·8	21·4	32·7	57·0	+19·3	81·0	99·0	63·6	63·0
94	107	113	110	8·0	103·4	16·8	2·20	17·6	−0·8	103·4	58·9	21·7	23·9	35·0	68·4	+27·7	83·8	100·0	66·2	66·2
95	99	100	100	7·0	90·6	17·6	2·23	15·6	+2·0	88·6	55·3	20·1	20·1	35·2	53·4	+17·7	80·6	98·4	60·3	58·3
														AVERAGE.....			81	99	61·0	60·5
N-low Period.																				
90	108	112	110	7·5	—	16·8	2·20	—	—	—	26·0	23·7	—	—	—	—	—	—	—	—
91	118	123	121	8·0	—	17·9	2·24	—	—	—	27·6	22·8	—	—	—	—	—	—	—	—
92	120	121	121	7·5	—	17·5	2·33	—	—	—	23·8	19·7	—	—	—	—	—	—	—	—
93	100	102	101	6·3	—	14·7	2·33	—	—	—	22·0	21·8	—	—	—	—	—	—	—	—
94	109	114	112	7·0	—	15·4	2·20	—	—	—	24·3	21·7	—	—	—	—	—	—	—	—
95	100	107	104	7·0	—	15·6	2·23	—	—	—	20·9	20·1	—	—	—	—	—	—	—	—

TABLE 4—(*continued*).

Rat No.	Initial Weight.	Final Weight.	Average Weight.	Daily Food Intake.	Daily N Intake.	Daily Faecal N.	Metabolic N.		Food N in Faeces.	Absorbed N.	Daily Urinary N.	Endogenous N.		Food N in Urine.	Retained N.	N-Balance.	Apparent Digestibility.	True Digestibility.	Biological Value.	Percentage Nett N-Utilization.
							Per Gm. Food.	Per Day.				Per 100 Gm. Weight.	Per Day.							
Whole White Maize (L)—"Potchefstroom Pearl"—Period (N = 1·291 *per cent.*).																				
96	128	132	130	9·0	116·0	20·0	2·17	19·5	+0·5	115·5	72·0	17·1	22·2	49·8	65·7	+24·0	82·7	99·6	57·0	56·8
97	117	122	120	8·5	110·0	20·4	2·29	19·5	+0·9	109·1	72·0	17·8	21·4	50·6	58·5	+17·6	81·4	99·2	53·6	53·2
98	125	132	128	9·0	116·0	22·3	2·20	19·8	+2·5	113·5	73·2	18·8	24·1	49·1	64·4	+20·5	80·8	98·0	56·8	56·6
99	130	137	134	9·5	122·5	22·1	2·41	22·9	−0·8	122·5	78·4	18·5	24·7	53·7	68·8	+22·0	82·2	100·0	56·2	56·2
100	131	140	136	10·0	129·1	24·2	2·19	21·9	+2·3	126·8	83·5	19·2	26·1	57·4	59·4	+21·4	81·4	98·2	54·9	54·0
101	120	124	122	8·5	110·0	17·0	2·14	21·4	−4·4	110·0	70·6	19·5	23·8	46·8	63·2	+22·4	84·6	100·0	57·4	57·4
														AVERAGE.....			82	99	56·0	55·7
N-low Period.																				
96	133	140	137	9·0	—	19·5	2·17	—	—	—	23·4	17·1	—	—	—	—	—	—	—	—
97	124	134	129	8·5	—	19·5	2·29	—	—	—	23·0	17·8	—	—	—	—	—	—	—	—
98	132	140	136	9·0	—	19·8	2·10	—	—	—	25·6	18·8	—	—	—	—	—	—	—	—
99	133	141	137	9·0	—	21·7	2·41	—	—	—	25·3	18·5	—	—	—	—	—	—	—	—
100	138	146	142	9·0	—	19·7	2·19	—	—	—	27·3	19·2	—	—	—	—	—	—	—	—
101	127	135	131	8·5	—	18·2	2·14	—	—	—	25·5	19·5	—	—	—	—	—	—	—	—

TABLE 5.

Percentage Utilization of the Proteins of some South African Varieties of Maize at about 8 Percentage Protein Level.

Variety.	Apparent Digestibility. (Average).	True Digestibility. (Average).	Biological Value. (Average).	Nett Utilization of Nitrogen (Average).
A. Eksteen (yellow)	83	99	69·9 ± 1·409	69·1
B. Blits (yellow)	83	98	69·8 ± 1·745	68·5
C. Robyn (yellow)	84	98	60·4 ± 1·004	59·4
D. Hotnot (yellow)	82	96	61·3 ± 0·839	58·9
E. Sahara (yellow)	82	98	59·3 ± 1·146	58·6
F. Peruvian (yellow)	86	99	58·6 ± 1·338	58·2
G. Commercial (yellow)	82	99	58·6 ± 1·016	58·3
G1. Commercial (yellow)	82	100	58·5 ± 1·208	58·3
H. American Flint (white)	81	99	60·4 ± 1·437	59·7
J. Anveld (white)	83	100	55·5 ± 0·973	55·5
K. Hickory King (white)	81	99	61·0 ± 1·472	60·5
L. Potchefstroom Pearl (white)	82	99	56·0 ± 0·594	55·7
M. Unknown (yellow)	80	98	74·9 ± 1·798	73·3
N. Unknown (white)	82	99	67·4 ± 2·398	66·8

Table 6.

Statistical Analysis of Results.

Maize Varieties.	A.	B.	C.	D.	E.	F.	G.	H.	J.	K.	L.	M.	N.
A. Eksteen.....	—	O	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	O
B. Blits.....	O	—	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	O
C. Robyn.....	XX	XX	—	O	O	O	O	O	XX	O	X	XX	XX
D. Hotnot.....	XX	XX	O	—	O	O	O	O	XX	O	X	XX	XX
E. Sahara.....	XX	XX	O	O	—	O	O	O	X	O	O	XX	XX
F. Peruvian.....	XX	XX	O	O	O	—	O	O	O	O	O	XX	XX
G. Commercial.....	XX	XX	O	O	O	O	—	O	O	O	O	XX	XX
H. American Flint.....	XX	XX	O	O	O	O	O	—	XX	O	X	XX	XX
J. Anveld.....	XX	XX	X	X	X	O	O	X	—	X	O	XX	XX
K. Hickory King.....	XX	XX	O	O	O	O	O	O	XX	—	XX	XX	XX
L. Potchefstroom Pearl....	XX	XX	X	XX	O	O	O	X	O	XX	—	XX	XX
M. Unknown.....	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	—	XX
N. Unknown.....	O	O	XX	XX	XX	XX	XX	XX	XX	XX	XX	XX	—

O = No significant differences.
X = Significant difference at P = ·05.
XX = Significant difference at P = ·01.