Agronomic Characters and Chemical Composition of Some Corn Hybrids Grown in Libya

JAGDEV S. SAWHNEY, VLADIMIR STOYANOV AND ADEL J. SALMAN[1]

ABSTRACT

The agronomic and chemical characteristics of 16 corn hybrids were studied. The agronomic characteristics studied were grain yield, straw yield, ear weight and grain size. The chemical characteristics evaluated were the percentages in corn grain of protein, fat, fiber, N.F.E., ash and the T.D.N. and S.E.

A.T.C. 57, A.S.C. 61 and A.S.C. 95 were generally good producers of grain. A.S.C. 59 and Ertano had good grain yield with poor stover yield. Appollo 136 had good stover yield and poor grain production. A.T.C. 57, A.S.C. 61 and A.S.C. 95 proved dual purpose with emphasis on grain, A.S.C. 73, A.T.C. 89 and Cervino proved dual purpose with emphasis on stover, perhaps as silage.

No relationship was apparent between yield and protein content. Some high yielding hybrids as A.S.C. 61 had high protein content while others had a high T.D.N. and S.E. values (A.T.C. 57). There was a linear relationship between protein and fat, $r = 0.74$. N.F.E., T.D.N. and S.E. were similar in the different hybrids. The ash data was erratic and variable.

INTRODUCTION

Very little information is available on the performance of corn hybrids in Libya. Abu Sharr (1) noticed poor establishment of corn in his observation plots at Zorda. The average yield of corn per hectare in Libya in 1971 was about 15% higher than the average yield of barley per hectare and still the irrigated area under corn was only 7% of that under barley (3). Fuad, J. A. K. (unpublished data.) found Appollo 136, Cervino, Ercole, Asgrow 33, Cecilope quite successful and A.T.C. 89 high yielding followed by A.T.C. 57, A.S.C. 51 and A.S.C. 59. These results indicate the necessity of selecting high yielding hybrids and the possibility of their introduction into Libyan agriculture.

While high yield is in itself a desirable character in a hybrid, its quality characters cannot be ignored because corn is a basal feed in animal nutrition. From the composition standpoint, corn has a lower level of crude fiber and higher level of fat than barley, wheat

[1] *Jagdev S. Sawhney, Vladimir Stoyanov and Adel J. Salman, Faculty of Agriculture, University of Tripoli, Tripoli, Libya.*

or rye. Furthermore, the total digestible nutrients (T.D.N.) and metabolizable energy of corn are also superior to other cereals. The importance of high protein content in corn has been illustrated by Ross *et al.* (7), who found higher production of wool as well as weight gain by feeding hybrids with high protein content. Aurand *et al.* (4) found that in high yielding hybrids the protein content may also be high. Hopkins *et al.* (5) found a negative correlation between protein and carbohydrate and very low positive correlation between protein and oil in corn grain. These results are, of course, from very old corn varieties which were not bred for these characters.

This paper deals with the agronomic characters of some corn hybrids as yield of grain and stover, size of ear, grain weight and the chemical composition of the grain like crude protein, crude fiber, ether extract, nitrogen free extract and ash.

The total digestible nutrients (T.D.N.) and starch equivalent values (S.E.) of these corn hybrids are also reported.

MATERIALS AND METHODS

Sixteen corn hybrids obtained from the Ministry of Agriculture, Tripoli, Libya, were planted on 15 March 1970 at the Bunkhela Farm of the Faculty of Agriculture of the University of Tripoli, Tripoli. These hybrids were planted in plots seven metres long. Each plot consisted of 3 rows of corn with 70 cm between the rows and 40 cms between the plants. Two seeds were planted per hill, 600 kg/ha of 12–24–12 was applied before planting. The experiment was laid out on a randomized complete block design. The plants were thinned to keep one plant per hill. There were approximately 36,000 plants per hectare. The plants were top dressed with 200 kg of ammonium sulphate when about 15 cm high. The plants were irrigated weekly. One middle row was harvested for yield of grain and stover on 13 August 1970. Three representative ears were taken from the harvested material for ear weights. The weight of 1,000 grains was calculated by taking samples from the shelled grain from the harvested material. All calculations on the above observations were on the dry matter basis.

The proximate analysis of ground corn grain was conducted according to the weende method modified by A.O.A.C. (2). The co-efficients of digestibility of the different components used were; protein 77%; fat 90% and fiber 57%. T.D.N. and S.E. were calculated as described in Morrison (6).

RESULTS AND DISCUSSION

Agronomic Characters

The data on grain yield, stover yield, weight of ears and weight of 1,000 grains are given in Table 1. The grain yield of hybrids varied from 1.88 to 3.77 tons per hectare. A.T.C. 89, A.T.C. 57, A.S.C. 59, A.S.C. 95, and A.S.C. 61 were the highest along with Ertano. A.S.C. 73, A.S.C. 51, Iowa 4417, U 40, U 42, Cervino and 39 V 3G were intermediate. The grain yield of ercole, U 32 and Appollo 136 was the lowest. These differences were not statistically significant.

A.T.C. 57, A.S.C. 61 and A.S.C. 95 were good grain producers and intermediate stover producers, A.S.C. 73, Cervino and A.T.C. 89 were good stover producers and intermediate grain producers and A.S.C. 59 and Ertano were good grain producers and poor stover producers while Appollo 136 was a poor grain producer and a good stover producer. So A.T.C. 57, A.S.C. 61 and A.S.C. 95 may be termed as dual purpose, with

Table 1 Grain yield, Stover yield, Ear weight and weight of 1,000 grains of some corn hybrids grown in Libya.

Hybrid[1]	Yield tons/ha		Ear wt(g)	Wt 1,000 Grains(g)
	Grain	Stover		
Ercole	2.11	2.40	112	241
Cervino	2.37	4.30	144	265
39V3G	2.36	2.30	125	276
U 32	1.54	2.35	126	214
U 40	2.48	3.40	118	261
U 42	2.79	3.65	120	314
Appollo 136	1.88	3.75	128	298
Iowa 4417	2.85	2.65	62	176
A.T.C. 57	3.77	3.25	170	281
A.S.C. 51	2.61	2.50	85	215
A.S.C. 59	3.75	1.40	133	257
A.S.C. 61	3.27	3.05	170	238
A.T.C. 89	2.82	4.00	147	247
A.S.C. 73	2.45	4.35	144	303
A.S.C. 95	3.57	2.70	155	316
Ertano	3.10	1.55	134	241
L.S.D. (.05)	N.S.	N.S.	N.S.	28

[1]Produced by Asgrow and Fedit, Italia

emphasis on grain, and A.S.C. 73 and Cervino dual purpose with emphasis on stover. Cervino, A.S.C. 73, A.T.C. 89, and A.S.C. 51 may be useful for silage or other green chop uses in the dent stage. A.S.C. 59 was a good grain producer and Appollo 136 a good stover producer.

There was no significant difference between the ear weight because of variability among the hybrids, the weight of 1,000 grains was however, significantly different, A.S.C. 95, A.S.C. 73 and U 42 had the largest grain. This did not correspond to the higher yield per hectare. The hybrids with the medium sized grain usually produced the highest yield.

The results on grain yield are similar to those of Fuad, J. A. K. except in the case of Appollo 136, 39V 3G, and these hybrids should be rechecked for their agronomic characteristics.

Chemical composition and nutritive value of corn grain.

The data on chemical composition of corn grain (protein, fat, fiber, N.F.E. and ash) and total digestible nutrients and starch equivalent are given in Table 2. The protein content in different hybrids showed highly significant differences. A.T.C. 57, Appollo 136 and A.S.C. 61 had the highest level of protein, U 40, Ercole, and Iowa 4417 were the lowest, while others were intermediate. All the hybrids of the A.T.C. or A.S.C. series were in the high or intermediate range. Hybrids of the A.T.C. and A.S.C. series yielded more grain than the other hybrids. Although there was no apparent correlation between the yield and crude protein, close examination of the data reveal that some high yielding corn hybrids had high percent protein thus making it possible to select hybrids with high yield and better quality based on protein.

The data on the crude fat and crude fiber showed no significant differences among the hybrids. There was, however, a linear positive correlation ($r = 0.74$) between the crude protein and crude fat. This relationship can be expressed by: $\%$ fat $= 1.82 + 0.59$

Table 2 Proximate analysis, digestible protein (DP), TDN and SE for corn kernels.

Hybrid	Water %	Protein %	Fat %	Fiber %	N.F.E. %	Ash %	D.P. %	T.D.N. %	S.E. %
Ercole	11.00	8.94	4.08	2.57	83.05	1.35	6.34	83.93	83.05
Cervino	10.46	9.94	4.24	3.17	81.09	1.55	6.85	82.50	81.68
39V3G	11.54	9.90	3.83	2.70	81.91	1.41	6.74	82.56	80.69
U 32	11.47	10.77	4.21	2.81	80.64	1.68	7.35	82.78	81.90
U 40	10.42	8.79	4.47	2.01	83.75	0.99	6.70	84.95	84.12
U 42	11.72	10.72	3.85	2.20	82.05	1.19	7.29	82.65	81.80
Appollo 136	10.21	11.74	3.47	1.96	81.66	1.78	8.10	83.92	83.05
Iowa 4417	10.20	9.36	3.92	2.01	83.02	1.71	6.43	83.96	83.16
A.T.C. 57	11.02	12.76	3.58	2.69	79.56	1.41	8.72	87.70	86.84
A.S.C. 51	11.17	10.18	3.98	2.48	82.21	1.16	6.95	83.76	82.85
A.S.C. 59	11.11	10.36	3.51	2.09	82.87	1.18	7.09	82.97	82.17
A.S.C. 61	12.45	11.36	4.83	2.08	80.30	1.44	7.65	82.59	81.63
A.T.C. 89	12.06	10.58	3.98	2.43	81.85	1.17	7.14	82.32	81.51
A.S.C. 73	10.38	10.83	4.59	2.31	81.37	1.21	7.45	84.26	85.33
A.S.C. 95	12.18	10.65	4.34	2.06	81.37	1.59	7.20	82.41	81.53
Ertano	12.09	9.92	3.35	2.60	82.81	1.28	6.71	82.24	81.43
L.S.D. (.05)	—	1.52	N.S.	N.S.	—	—	—	—	—

N.F.E., T.D.N. and S.E. are abbreviations of Nitrogen Free extract, Total digestible nutrients and Starch equivalent, respectively.

(% protein). The values of N.F.E., T.D.N. and S.E. were similar in the different corn hybrids. The percentage of ash was erratic in the replicates of the same hybrids. A.T.C. 57, the corn hybrid, with the highest yield had the highest T.D.N. and S.E. values and the lowest N.F.E.

LITERATURE CITED

1. Abu Sharr. 1962. Crop agronomy and improvement in Cyrenaica. Report No. 1577, FAO, Rome.
2. Anonymous. 1965. Official methods of analysis of the Association of Agricultural Chemists. Washington D.C. 20044, U.S.A.
3. Anonymous. 1972. Statistics of Agriculture sector. Publication No. 2 Ministry of Agriculture and Land Reforms, Tripoli, Libya.
4. Aurand, L. W. and R. C. Miller. 1949. Influence of heredity on crude protein and carotene content of corn. Federation Proc. 8:378.
5. Hopkins, C. G., L. H. Smith, and E. M. East. 1903. The structure of corn Kernel and the composition of its different parts. Ill. Agr. Exp. Sta. Bull. 87.
6. Morrison, F. 1959. Feeds and feeding. Morrison Publishing Company, Clinton, Iowa. U.S.A.
7. Ross, C. V., U. S. Garrigus, T. S. Hamilton, and E. B. Earley. 1952. Comparison of high, medium high and low protein corn for fattening lambs. J. Animal Science 11:77.