III. REPORTS FROM COOPERATORS

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Data on stalk breaking force and certain morphological characteristics of stalks in maize — Lodging has become a serious problem in overmaturing maize, especially during the past few years in Hungary. Higher plant populations, intensive nitrogen fertilization and the cultivation of maize mostly in monoculture along with the probable formation of more virulent forms of fungi cause as much as 40 to 60% lodging in the field. The objectives of these studies on lodging were (1) to investigate certain stalk characteristics including the resistance to breakage at different internode levels and (2) to study the relationships between breaking force and the length and diameter of the internodes.

We studied one hybrid, 156 x B14, which is resistant to lodging, and another, 156 x N6, which is susceptible to stalk lodging under natural conditions. Individual plants (70) from these hybrids were evaluated at overmaturity, at the end of November 1973. We used simple equipment to break the stalks. The inbred line 156 is Hungarian, while the lines B14 and N6 are of American origin.

The data in Table 1 show that the percent of lodging (natural lodging below the ear), the stalk dimensions and the resistance to breaking vary at different internode levels. Lodging was greatest at the third and fourth internodes in both hybrids.

In the hybrid 156 x B14 the short, thick internodes were the most resistant to breaking. The breaking force varied from 14.38 to 21.46 kg, a range of 7.08 kg. The mean values of breaking force of the hybrid 156 x N6 — which is susceptible to lodging — are rather low; there are no significant differences between the examined internodes. The extreme values for breaking force varied from 15.78 to 16.01 kg, a difference of only 0.22 kg.

On the basis of breaking force data for the lodging-resistant hybrid 156 x B14, it can be stated that the third node has a determinative effect on stalk breaking force; therefore it is enough to examine the characteristics of the stalk at the third internode only. The hybrid 156 x N6 exhibited no differences in breaking force at the different internodes.

We calculated correlations between breaking force and internode length and diameter at the first five internode levels of the hybrids 156 x B14 and 156 x N6. We have found a significant negative correlation between breaking force and the internode length at the second (-0.1552^{+++}, NS) and third (-0.3297^{++} and -0.3970^{+++}) internodes. Correlations of breaking force with internode diameter for hybrid

Table 1. Mean observations on breaking force and certain stalk characteristics of the single-cross hybrids 156 x B14 and 156 x N6.

Node number (from base)	Node length cm	Index*	Node diameter cm	Index*	Breaking force kg	Index*	Lodging percent	Index*
				156 x B14				
1	14.44	68.8	2.59	112.1	21.46	119.6	0.0	-
2	18.14	86.4	2.49	107.8	20.85	116.2	2.4	38.1
3	21.00	100.0	2.31	100.0	17.94	100.0	6.3	100.0
4	20.97	99.9	2.15	93.1	15.94	88.8	4.1	65.1
5	20.73	98.7	2.02	87.4	14.38	80.2	1.4	22.2
				156 x N6				
1	11.33	71.9	2.58	109.3	15.98	100.6	1.5	5.9
2	13.98	88.8	2.48	105.1	15.88	99.9	12.3	48.4
3	15.75	100.0	2.36	100.0	15.89	100.0	25.4	100.0
4	16.84	106.9	2.21	93.6	16.01	100.8	14.7	57.9
5	16.80	106.7	2.07	87.7	15.78	99.3	4.2	16.5

*Index (percent) in relation to third internode

156 x B14 were positive and highly significant at all five internode levels; these r values were: 0.7047^{+++}, 0.6559^{+++}, 0.6928^{+++}, 0.6243^{+++} and 0.6768^{+}. On the other hand, in the hybrid 156 x N6 the r value was significant only at the second internode level (0.4464^{+++}).

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Comparison of homozygous opaque-2, heterozygous and normal in hybrid 156 x B14 — We developed several heterozygous and homozygous opaque-2 hybrids and their normal analogues with the general formulae A x B, A x B o2 and A o2 x B o2. The yielding ability and other agronomic characteristics of the hybrid 156 x B14 and its two different opaque-2 forms are reported here.

One hundred plants of each hybrid were examined individually, and the data on the most important characteristics are presented in Table 1. It will be seen that the flowering time of the hybrids was practically the same; however, there was a significant difference in the earliness of normal and opaque forms as indicated by the moisture content at harvest. The moisture content of homozygous and heterozygous opaque was higher by 13.2% and 5.6%, respectively, than that of the normal analogue.

Table 1. Comparison of homozygous opaque-2, heterozygous and normal in hybrid 156 x B14.

Combinations	Days to 50% male flowering	Moisture content (%)	Shelling Percentage	Dry grain yield per plant (g)	1000-grain weight (g)	
					normal	opaque
156 x B14	83	30.2	83.5	203.0	294.9	-
156 x B14 o2	82	31.9	83.0	192.0	293.8	253.8
156 o2 x B14 o2	82	34.2	81.1	182.7	-	249.2
L.S.D. 5%				6.4		
Percent of the normal hybrid						
156 x B14	100.0	100.0	100.0	100.0	100.0	-
156 x B14 o2	98.8	105.6	99.4	94.6	99.6	86.1
156 o2 x B14 o2	98.8	113.2	97.1	90.0	-	84.5

The most important differences were found in the yielding ability of the hybrids. It can be seen in Table 1 that the dry grain yield of the heterozygous 156 x B14 o2 hybrid was nearer to the normal: the difference was 5.4%; the grain yield of 156 o2 x B14 o2 was 4.6% less than that of the heterozygous opaque hybrid and 10% less than that of the normal hybrid, a result of the joint effects of such agronomic characteristics as higher moisture content at harvest, lower kernel weight and poor shelling percentage.

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