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Morphology and Cytology of Some Hybrids Between *Elymus canadensis* and *E. virginicus*¹

By RICHARD W. POHL

Abstract. Examination of 810 florets from hybrid plants found in a roadside colony yielded 48 seeds. From these, 37 plants showing a wide variety of characteristics were obtained. Some were decidedly "canadenoid", others were strongly "virginicoid", but none had all the characters of one species. Cytological study of pollen mother cells showed meiosis to be fairly regular, although some difference in length of members of several chromosome pairs was evident.

Although both *Elymus canadensis* L. and *E. virginicus* L. are highly variable species, they are ordinarily readily distinguishable even by casual observation. From a moving car, it is possible to recognize the stiff, erect, short-awned spikes of *E. virginicus*, and the nodding, lax, bristly inflorescences of our vigorous local *E. canadensis*. These two are our only common roadside species in central Iowa. It was rather startling, therefore, to see a new and strange *Elymus* in a roadside colony of drooping *E. canadensis*. These plants occurred along the east side of the river road on the west bank of the Des Moines River, in the N. E. corner of Sec. 28, Hardin Twp., Webster County. The spikes of the strange plants stood at least a foot above the level of the *E. canadensis* plants with which they grew. Their spikes were erect, and the straight awns shorter than the curved ones of the *E. canadensis* plants. When observed in October of 1957, the inflorescences had not shattered. Living plants were transplanted into the greenhouse and grown for further examination. Inflorescences collected from the wild plants were dissected to determine whether they bore seed. In 810 florets examined, 48 seeds were found, giving approximately 5 percent fertility in this sample. Two additional kernels were ergotized.

The 48 seeds were planted on sand and incubated in a laboratory germinator. Thirty-seven green seedlings and one albino were obtained. Since these seedlings came from open-pollinated seed, it was of course impossible to determine the male parent. The presence of an albino seedling suggested some meiotic disturbance. The seedlings, as grown in the greenhouse, differed greatly in appearance. In

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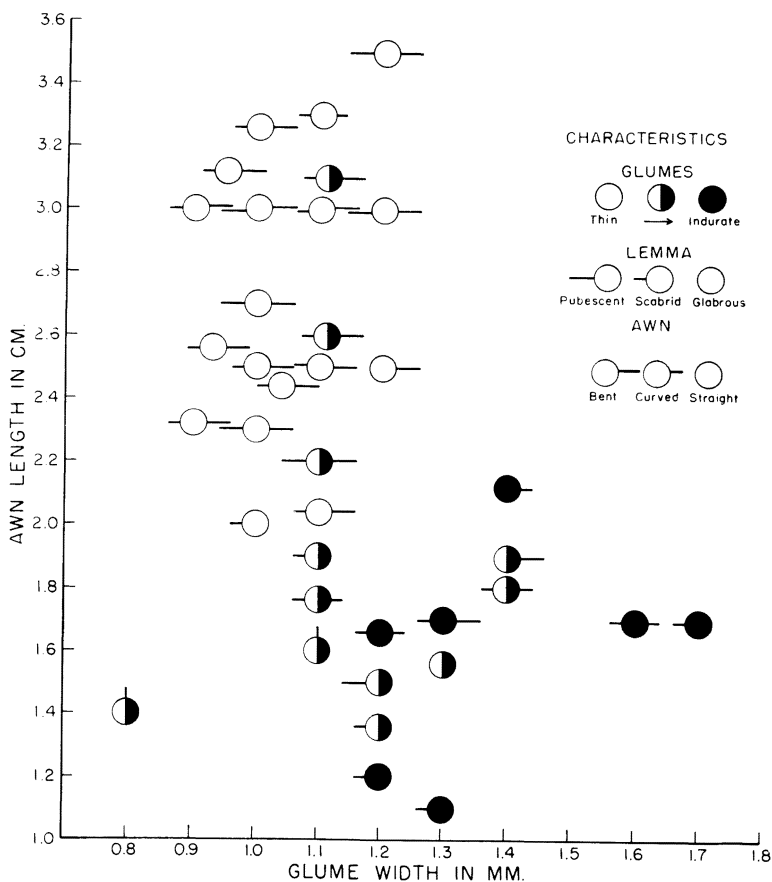


Figure 1. Progeny obtained from wild seed of hybrid *Elymus*, Pohl 7701. Note the extreme width of the glumes in some individuals.

some the foliage was strongly glaucous, in others, green. Many plants showed pronounced purple coloration on the sheaths. When the seedlings came into bloom, the inflorescences and spikelets showed many features of *E. virginicus* and *E. canadensis*, in various combinations.

These two species differ in the following characters, among others:

Characteristic	<i>E. canadensis</i>	<i>E. virginicus</i>
Awn length	long	short or absent
Awn curvature	strongly bent	straight
Glume width	usually 1 mm. or less	1.2 mm. or wider
Lemma induration	slight	strong
Lemma pubescence	hirsute	glabrous (except vars.)
Spike attitude	drooping	stiff, erect

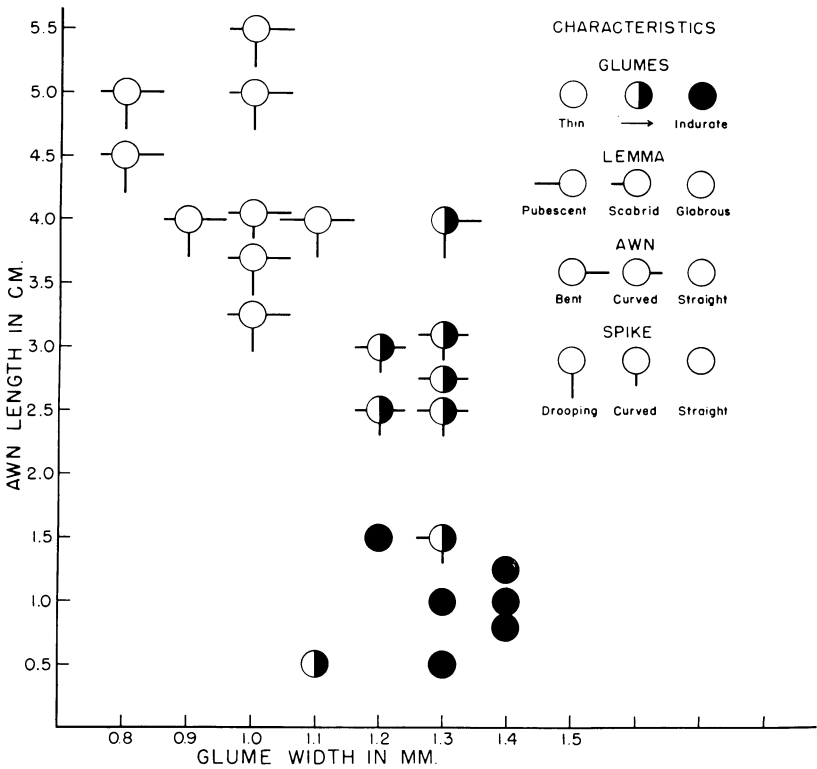


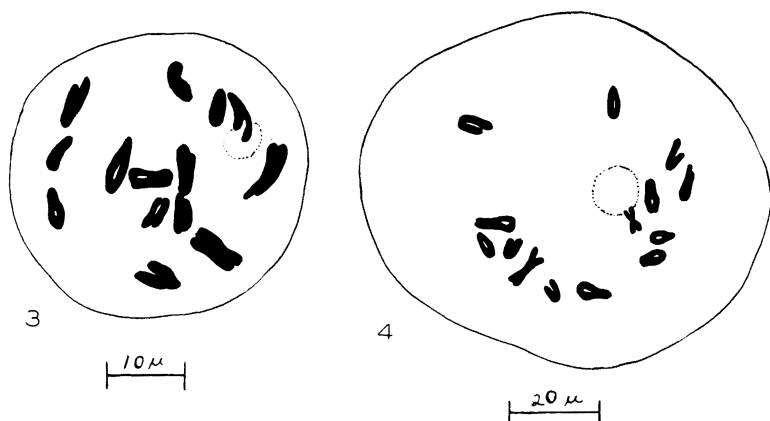
Figure 2. Mass collection made along a transect through a colony of *E. canadensis*, *E. virginicus*, and their hybrid. The *E. canadensis* parent appears at the upper left, *E. virginicus* at the lower right (Pohl 7712).

Of these characteristics, the width and induration of the bases of the glumes are most often used to differentiate these species. Taxonomists doing routine identification of the two species are frequently puzzled by intermediates between them. These are usually referred to *E. virginicus*, or to one of the multitudinous named varieties and forms under this taxon.

The progeny grown from the wild seed were scored for glume width, awn length, glume induration (thin, intermediate, indurate), lemma pubescence (pubescent, scabrid, glabrous) and awn curvature (bent, curved, straight). The scores were plotted on a scatter diagram (Figure 1) designed so that individuals with all characters of *E. canadensis* would appear in the upper left portion of the diagram, while those with the characters of *E. virginicus* would appear in the lower right. The 37 plants plotted showed a wide variety of characteristics. Although some were decidedly "canadensoid" and others were strongly "virginicoid", there were no individuals which had all of the characters of one species or the other.

From the taxonomic standpoint, this diagram is very revealing. It suggests strongly that many of the intermediates which plague the taxonomist in attempting to sort the usual *Elymus* collection are of direct or remote hybrid origin. It has been shown by Church (1958) that it is possible to hybridize *E. canadensis* and *E. virginicus* and obtain vigorous F_1 's, particularly when the two parents come from geographically separated areas. Church also noted that when *E. canadensis* was used as the pistillate parent, the offspring were taller than either parent, as in the present case.

In October of 1958 the same colony of *Elymus* was revisited. The hybrid plants were still conspicuous among numerous individuals of *E. canadensis*. *E. virginicus* was also abundant along the road shoulders. A mass collection was made by taking individual



Figures 3 and 4. Meiosis in hybrid progeny. Figure 3 is taken from Pohl 7701-VII; Figure 4 from Pohl 7701-S.

culms from plants of both species and the intermediates along the shoulder in a transect through the colony. This collection was scored for the same characteristics as the hybrid progeny previously discussed. In addition, the degree of curvature of the spike was also scored. Those data were plotted in Figure 2. The individuals plotted fell into two fairly distinct species groups, with the hybrids between them. The relative uniformity of the hybrids (half-darkened circles on the diagram) suggested that they were probably F_1 's. This hypothesis was given further support by their low fertility, which would probably tend to prevent establishment of subsequent generations.

Cytological analysis of pollen mother cells of the hybrid progeny (Pohl 7701) grown in the greenhouse showed that meiosis was fairly regular, with 14 pairs of chromosomes being formed. Some differ-

ence in length of members of several pairs is evident in the illustrations. The two cells shown are from different plants. The cell in Figure 3 is from a "virginicoid" individual, that in Figure 4 from a more "canadensoid" one.

Literature Cited

Church, G. L. 1958. Artificial Hybrids of *Elymus virginicus* with *E. canadensis*, *interruptus*, *reparius*, and *wiegandii*. *Am. Jour. Bot.* 45: 410-417.

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