Seed Characteristics of Bluejoint and Techniques for Threshing[1]

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Several species of *Calamagrostis,* commonly called reed grasses, are native to and widely distributed in Alaska. The most widespread and abundant of these species is bluejoint *(C. canadensis)* known also as bluejoint reedgrass which occurs in Alaska, Canada and all but southeastern continental United States (Hitchcock, 1951). *C. canadensis* subspecies *Langsdorfii* (Hulten, 1942), also referred to as *C. canadensis* variety *scabra* (Hitchcock, 1951), is the dominant bluejoint covering vast rangeland areas across southern Alaska and is the grass described in this report.

Bluejoint is an extremely winterhardy perennial that spreads by underground rootstocks. Uniquely adapted to the cool growing seasons and high rainfall characteristic of the rangelands adjacent to the Gulf of Alaska including the many islands along the coast (Piper, 1905; Johnson, 1961), bluejoint thrives vigorously and often attains heights of 4 to 7 feet. Seeds are easily wind-borne enabling bluejoint to quickly invade burned-over areas. Ranchers report that this grass is palatable and nutritious if utilized before advanced stages of maturity.

The widespread abundance of bluejoint and its desirable characteristics mentioned above suggested that this grass might possess considerable economic value for rangeland establishment or conservation purposes such as erosion control if adequate seed could be harvested from native or cultivated stands and satisfactory processing methods devised.

Seed-bearing panicles of bluejoint (Figure 1,A) are borne in abundance in native stands and several sacksful were hand-harvested for use in threshing and processing trials. When panicles were threshed in a small, spiked cylinder and concave separator, a very light and fluffy mass of material unusable in conventional seeding machinery was obtained (Figure 1, B). Almost all caryopses remained intact within the floret structures and so seed separation was impossible without additional processing. The cause of the fluffiness in the threshed material is the collective effect of tufted rings of bristly, minute hairs arising from the callus at the base of each lemma (Figure 1, C and Figure 2). No difficulty was encountered in dislodging the internal floret structures from the glumes. Disarticulation at this point on the rachilla is characteristic in the genus *Calamagrostis.* In fact, release of the united lemma, palea and enclosed caryopsis occurs readily at maturity in nature and the callus hairs undoubtedly assist in expelling the lemma-palea-caryopsis structure from the glumes as these hairs diverge and stiffen upon drying at maturity. The callus hairs diverge upward and outward from the lemma and palea and are about as long as those structures. These hairs cushion the impact of thresher teeth and prevent the very minute and light-weight caryopses from being dislodged from lemma and palea.

Additional threshing trials were undertaken in cooperation with Mr. J. E. Harmond of the U. S. Department of Agriculture at the Small Seed Harvesting and Processing Laboratory at Corvallis, Oregon. Successful threshing was achieved using a recently developed machine (Harmond, 1956) that possesses rubber-covered metal bars attached for their full length to the cylinder and to the concave. Clearance between bars on cylinder and concave can be adjusted down to zero. After several trial runs, bluejoint seeds were effectively dislodged from other floret structures with mechanical settings as follows: cylinder-concave clearance — zero; cylinder speed—1480 rpm; tailgate opening—¼ inch; and fan speed—disconnected.

In another threshing trial in cooperation with the U. S. Department of Agriculture Soil Conservation Service Plant Materials Center at Pullman, Washington (Stroh and Schwendiman, 1961)[2] satisfactory threshing of bluejoint was achieved with a Ball Hammer mill, Model No. 1-Modern, a machine with 6-inch hinged hammers. Hammer mills have been used successfully to process seed of several other native grasses that retain undesirable appendages not removed in the normal threshing operation (Weber, 1939; Schwendiman, et al. 1940). Maximum effectiveness in dislodging seed with minimal damage to the caryopses was achieved when seed was fed into the hammer mill at full capacity for the machine. When the hammer mill was operated at 1200 rpm and equipped with a screen with ½-inch diameter, round holes, approximately 60 percent of the caryopses were dislodged from the lemmas and 25 to 30 percent

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[2]*Unpublished report, 1961. Stroh, J. and J. L. Schwendiman.*

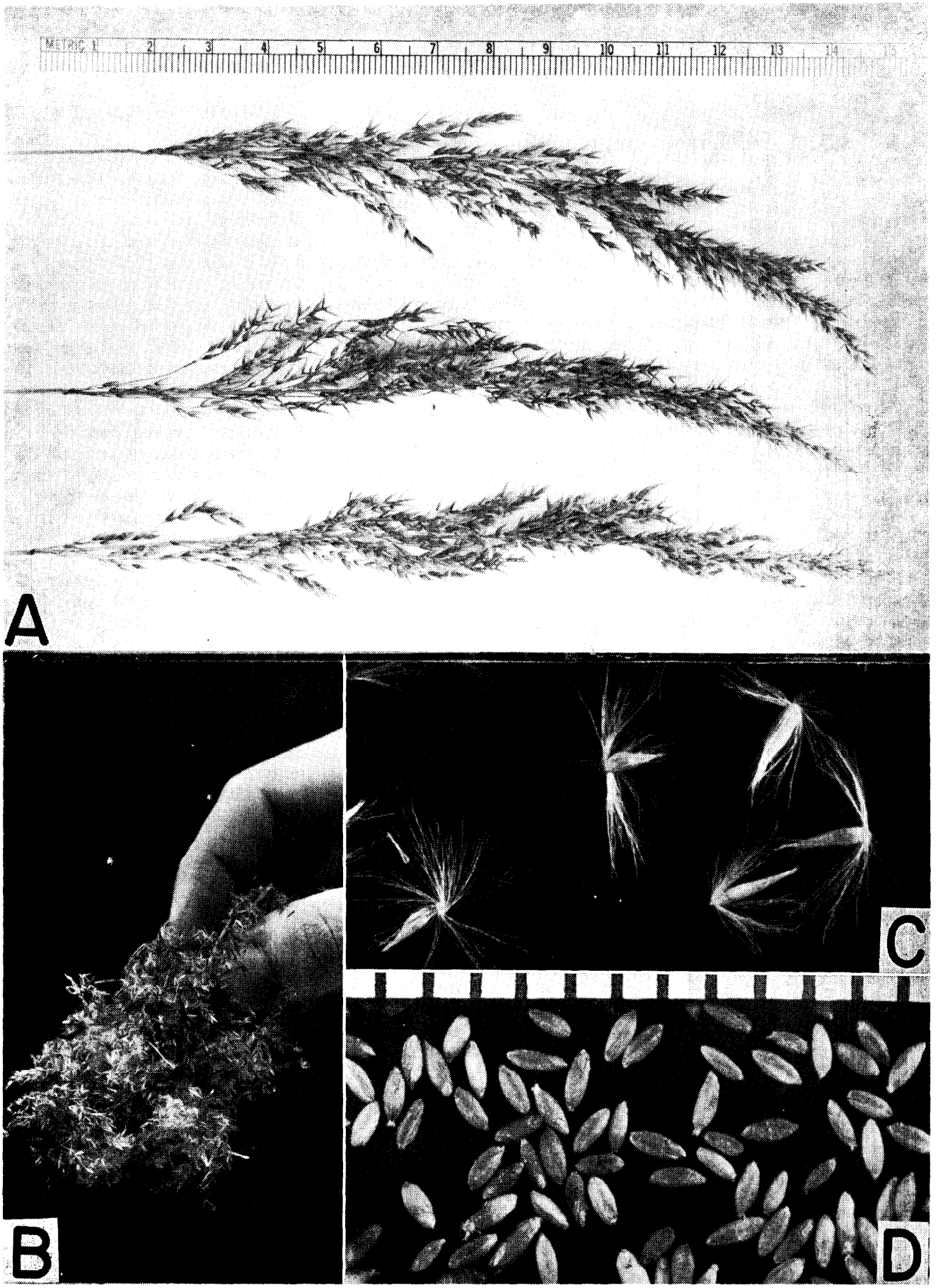

FIGURE 1. Appearance of mature bluejoint panicles and seed during different stages of processing. (A) panicles before threshing, (B) fluffy seed mass as obtained from unsatisfactory processing in spiked cylinder and concave thresher, (C) detailed view of seed-bearing lemmas showing callus hairs and (D) naked caryopses as obtained from hammer mill and rasping-bar thresher. Smallest scale divisions in each photo are millimeters.

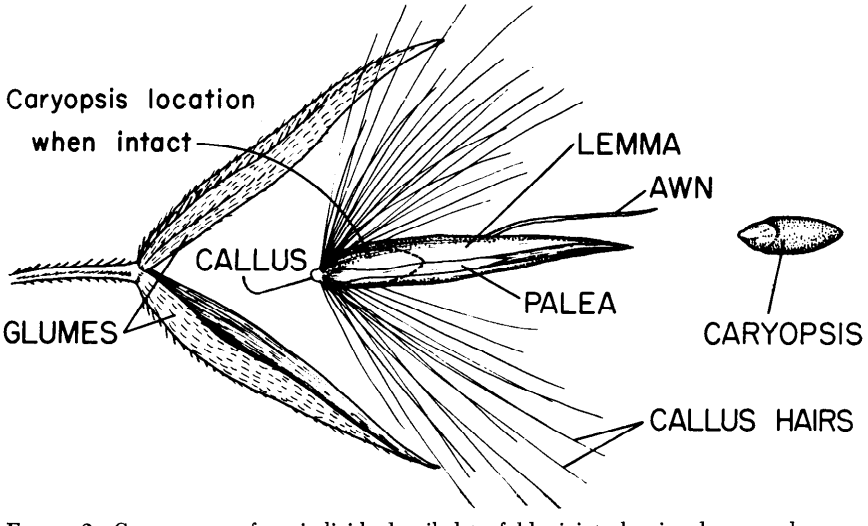

FIGURE 2. Components of an individual spikelet of bluejoint showing lemma-palea-caryopsis unit as it appears when released from glumes and naked caryopsis as it appears after release from lemma and palea.

of the callus hairs were removed from the lemmas.

Satisfactory recovery of seed from the threshed material was accomplished in both threshing trials with laboratory Clipper cleaners using a slow rate of feed. Frequent manual cleaning of the upper screen was necessary. Weights of samples threshed and yields of seed are summarized in Table 1 for the threshing done at Corvallis.

Germination tests with the naked caryopses as threshed resulted in 60 to 70 percent germination for a test period of 21 days.

Bluejoint seeds are extremely small and their appearance is not unlike minute kernels of wheat (Figure 1,D). Four 4,000-seed lots of naked caryopses that originated from several different native stands of bluejoint in southcentral Alaska were weighed with an analytical balance approximately 16 months after harvest. During this interval the seeds had been stored in a seed cabinet in a heated building. Seeds-per-pound values calculated from these determinations ranged from 3,604,000 to 3,769,000. The mean for all lots was 3,681,00 seeds per pound.

Table 1. Yields of bluejoint seed and other threshing fractions obtained by threshing and cleaning 3 lots of seed heads.

Original weight of panicle lots threshed*	Weight of threshed material		Yield of clean seed	
	Waste expelled from thresher	Uncleaned seed from thresher	Weight after cleaning	Percent of original lot threshed
	(Grams)			
1739	966	773	165	9.5
2143	1231	912	199	9.3
2041	1206	835	186	9.1

*Includes entire mature panicles and 4-6 inches of upper culm section immediately below panicles.

Bushel test weight determinations were derived using a standard Winchester-type measure and representative samples of naked bluejoint caryopses. The mean for all determinations was 53 pounds per bushel.

The trials reported here reveal that bluejoint seed can be satisfactorily threshed and dislodged from floret structures that possess copious undesirable callus hairs when certain specialized machinery is used. The plant material must be thoroughly dry and brittle for the achievement of maximum effectiveness in the processing operations. Although some modifications in equipment and techniques would be necessary for practical commercial processing of this seed, sufficient quantities of seed for agronomic trials have been obtained by the methods described.

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