

Crested Wheatgrass—Early History in the United States

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Abstract

The first known introduction of crested wheatgrass into North America was made in 1898 by N.E. Hansen of the South Dakota Agricultural Experiment Station from the Valuiki Experiment Station about 150 miles north of what is now Volgograd, U.S.S.R. This introduction did not become generally distributed or used. The second introduction received on an exchange basis from the same U.S.S.R. experiment station in 1906 was planted and increased at experiment stations in Newell, S.D., and Mandan, N.D. These increases were responsible for the early distribution and establishment of crested wheatgrass in the United States. The cultivar Fairway distributed in Canada from the University of Saskatchewan in the late 1920's came from one of the accessions of the second introduction first planted at Newell, S.D. Crested wheatgrass has become the most successful and the most widely used introduced grass in the semiarid and arid region of western United States.

Crested wheatgrass (*Agropyron cristatum*, *A. desertorum*, and related taxa), a persistent, drought and cold-resistant grass from the windswept steppes of central Asia, did not accidentally find its way to America and into general use in western United States and Canada. Soviet agronomists and our own plant explorers had the foresight to anticipate its possibilities. A few enthusiastic early-day workers tested, distributed, and promoted this grass for a period of at least 25 years before it really caught on during the drought years of the mid-1930's.

Not too many years ago crested wheatgrass was referred to in several publications as promising. No longer must we say it has promise, for we know that it is the most successful introduced species in the northern Great Plains and much of the West. It is one of the best examples of a foreign species becoming completely naturalized in its area of adaptation in North America. Our wealth of experience and success in growing this grass make concern about its possibilities unnecessary. Today it grows on more than 5 million ha (12.4 million acres) (Dewey and Asay 1975) in the United States and 800 thousand ha (2 million acres) (Lodge et al. 1972) in Canada.

Dillman (1946) published an excellent early history of crested wheatgrass. The senior author was well acquainted with Dillman¹ and provided him with old field notes and reference material from the Mandan station for his 1946 article. Lost names of important people and places be lost and forgotten with passing of time, it is the purpose of this paper to bring together and document the early history of crested wheatgrass in the United States, including some of the published and unpublished observations by early workers concerning adaptation and potential importance of the species.

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¹A.C. Dillman was employed by the Office of Drought and Alkali Investigations of the Bureau of Plant Industry, USDA, in charge of breeding forage crops for drought resistance at the Belle Fourche station, Newell, S.D., from 1908 until 1920, when he transferred to the Mandan, N.D., station. His forage work was stopped in 1921 when the Office of Drought and Alkali Investigations was discontinued.

Early Introductions

N.E. Hansen of the South Dakota Agricultural Experiment Station made a plant exploration trip to Russia and Siberia in 1897-98 for the U.S. Department of Agriculture. He observed crested wheatgrass under test at the Valuiki Experiment Station on the Volga River about 150 miles north of what is now Volgograd. He sent 5 lots of seed back to the United States, all classified as *A. cristatum* and commonly called "Zitniak" in the U.S.S.R. The numbers assigned to these lots were S.P.I. (Seeds and Plants Imported) 835, 837, 838, 1010, and 1012 (Cook 1899 a and b). Under No. 835, Hansen noted, "Native dry steppe grass. Seed from plants cultivated 1 year. Director Bogdan regards this species promising for cultivation." Some of the other 4 accessions were collected in the wild from dry sandy steppes in the vicinity of the experiment station. The distribution files of the U.S. Department of Agriculture indicate that a small amount of seed of these 5 accessions was sent to Alabama, Indiana, Michigan, Colorado, and Washington. However, so far as can be determined, no increase or general distribution was made of Hansen's first introduction.

The second importation of crested wheatgrass came from the same source as Hansen's. V.S. Bogdan, director of the Kostichev Agricultural Experiment Station, Valuika, Samara government, Russia, sent 6 lots of seed to the U.S. Department of Agriculture through the Moscow Botanical Gardens. The seed was received on December 12, 1906. S.P.I. 19536 was labeled *A. cristatum* and S.P.I. numbers 19537-19541, inclusive, were labeled *A. desertorum* (Fairchild 1908). Seed of one or more of these lots was distributed to 15 experiment stations. According to Dillman (1946) the successive plantings made at the Belle Fourche Experiment Station, Newell, S.D., from 1908 to 1915, inclusive, and at the Northern Great Plains Field Station, Mandan, N.D., starting in 1915, were responsible for the early distribution and establishment of crested wheatgrass in the United States.

In 1908, Dillman made the first plantings of the 6 1906 introductions at the Belle Fourche station. In 1909, he recorded in his field notebooks, "The grass nursery planted in 1908 was continued this season. S.P.I. numbers 19536-19541, inclusive, came through the winter without any winter killing, and were very early in beginning growth in the spring. This characteristic might make this species valuable as a pasture grass if it should prove to be valuable otherwise. There has been no effective test of drought resistance so far." Dillman (1910) also stated, "The grass botanically known as *A. cristatum*, recently introduced from Siberia by the U.S. Department of Agriculture, gives evidence of being a very hardy grass. It was observed that this species starts growth very early in the spring, and is not injured by severe frosts." Dillman soon recognized that S.P.I. 19536-received as *A. cristatum* was distinct from those received as *A. desertorum*. He noted that the plants were shorter and more leafy with wider comb-like heads. Due to editorial changes in Dillman's 1910 bulletin, both *A. cristatum* and *A. desertorum* were referred to as only *A. cristatum*. All crested wheatgrass was generally referred to as one species, *A. cristatum*, from 1910 until 1950. Swallen and Rogler (1950) suggested a re-separation into two species, *A. cristatum* and *A. desertorum*. According to S.P.I. card files, No. 19536 was sent to Professor

John Bracken of the University of Saskatchewan on September 29, 1911. In 1916, L.E. Kirk, then a graduate student assistant, planted the seed obtained by Professor Bracken. It was from these plantings of *A. cristatum* that Kirk (1932) and his associates developed "Fairway" crested wheatgrass.

Most of the early distributions of seed in the United States were of the *A. desertorum* types, S.P.I. numbers 19537-41, inclusive. The commonly used forage type was called "Standard" for many years. The name "Standard" came from the fact that S.P.I. 19537 was chosen as the standard for the species for Montana and was registered as such by the Montana Seed Growers Association. There were no other named varieties until "Summit" was released in Canada in 1953 and "Nordan", released in North Dakota in 1954. Several additional named varieties were released in the 1970's.

The third introduction of crested wheatgrass to the United States was made by Hansen and was received on December 3, 1908. At that time he was on another expedition to Europe and central Asia, again as an agricultural explorer for the U.S. Department of Agriculture. This introduction of numbers S.P.I. 24466-24468 was classified as *A. imbricatum*. In his notes (Fairchild 1909), Hansen stated "A grass of very wide distribution in northern Asia and European Russia. Highly recommended as one of the best grasses in the Volga River region of eastern European Russia, where it was brought into culture by the Valuiki experiment station." These 3 seed lots were collected from the wild in the semidesert region in the Mongolian part of northwestern Manchuria.

A few other early introductions of crested wheatgrass should be mentioned specifically by number. S.P.I. 28199 *A. cristatum* came from Cambridge University on May 7, 1910, with its native distribution shown as open sandy and stony places in eastern Germany and western Hungary (Fairchild 1911). Hansen sent S.P.I. 28306 *A. cristatum* from Russia in 1910. In his notes he again points out that this species is considered a very valuable grass, a native of the driest steppes of eastern Russia and a large part of Siberia. He also mentions selection work being done by Prof. R.W. Williams of the Imperial Agricultural College at Moscow (Fairchild 1911).

The first introduction of *A. sibiricum* was received through Hansen on May 20, 1910, as S.P.I. 28307. Quoting his notes: "A native of the dry steppes of eastern European Russia and western Siberia. The present lot is selection No. 1, grown from a single plant, by Prof. R.W. Williams, Imperial Agricultural College, Moscow, Russia" (Fairchild 1911). We do not know what happened to the 1910 introductions except that they did not get into general distribution. A few more introductions of crested wheatgrass species were made through the years but it was not until the 1930's that real emphasis was placed on getting many introductions of crested wheatgrass and other grasses for possible use in arid and semiarid regions of the U.S. The main sources of seed for these species were: The Westover-Enlow expedition to Russia, Turkey, and Turkestan in 1934; The Wellman-Westover expedition to Turkey in 1936; the MacMillan-Stephens expedition to China and Manchuria in 1934; the Roerich expedition to Manchuria in 1934; the Kazakstan Institute of Agriculture in 1935; and the Institute of Plant Industry U.S.S.R. in 1934 and 1935. Seed from these expeditions was increased and the plant material was evaluated at Mandan, N.D., and/or Pullman, Washington. Since then, several other expeditions have introduced additional accessions of crested wheatgrass into the U.S. Information on the recent introductions is available in other publications.

It was during the 1930's that many of the species making up the crested wheatgrass complex were introduced to the U.S. for the first time. The senior author and others working with this material in the late 1930's were soon aware that many of the introduced accessions were badly mixed and in a number of cases misnamed. It took several years to determine whether the mixtures were mechanical or genetic. Jason Swallen (1943) of the Bureau of Plant Industry and later with the Smithsonian Institution described the taxonomic status of *A. cristatum*, *A. desertorum*, *A. michnoi*, *A. sibiricum*, *A. imbricatum*, *A. pectiniforme*, *A. fragile*, and *A.*

mongolicum, all of which had been or are now called crested wheatgrass. A recent taxonomic treatment of the complex is that of N.N. Tzvelev (1976). Taxonomic confusion still exists, however, current and recent studies on the cyto-taxonomic status of this complex of species are providing useful information and the classification problems are slowly being resolved (Dewey and Asay 1975, Asay and Dewey 1979).

Other Early Workers and Locations

J.T. Sarvis of the former Division of Dry Land Agriculture, Bureau of Plant Industry, U.S. Department of Agriculture, Mandan, N.D., was one of the most enthusiastic early boosters of crested wheatgrass. His many plantings made from 1915 until his retirement in 1941 provided over 90 kg of seed that he distributed widely throughout the Northern Great Plains between 1918 and 1923. Over 1,800 kg of seed was distributed from the Mandan station for testing throughout the west from 1923 to 1935, inclusive. The oldest known seed production planting of the grass is at the Mandan station. This planting of S.P.I. 19538 *A. desertorum* was made by Sarvis in 1915. The oldest known pasture planting of crested wheatgrass still in existence was made on the Mandan station in 1932. It has been grazed every year since 1933, and present plans are to continue it as part of the long-term grazing trials. Beef gain for yearling steers averaged 103 kg/ha (92 lb/acre) per year for the period 1933 through 1963, compared with 47 kg/ha (42 lb/acre) on native range. The pasture has been fertilized with 45 kg N/ha (40 lb N/acre) since 1964. Beef gains for the period 1964 through 1979 averaged 207 kg/ha (185 lb/acre) compared with 101 kg/ha (90 lb/acre) for fertilized native range. These plantings are ample evidence of the vigor and longevity of crested wheatgrass at Mandan.

There were a number of early workers who boosted crested wheatgrass in the 1920's despite the apparent lack of need for a new dryland grass during the World War I period when grass was being plowed up. Some of those conducting research with the grass were David Stephens, Moro, Ore.; Alvin Keyser, Fort Collins, Colo.; Leroy Moomaw, Moccasin, Mont., and Dickinson, N.D.; Samuel Garver, Redfield, S.D.; and N.F. Woodward, Moccasin, Mont. Extension workers active in promoting the grass were M.L. Wilson and A.J. Oogaard in Montana. Early workers in Canada were L. E. Kirk, T.M. Stevenson, and S.E. Clarke. Early seed producers were Parker Brothers, Crescent, Mont.; D.C. Violet, Harlem, Mont.; and Leroy Moomaw, Dickinson, N.D. Oscar H. Will Seed Company, Bismarck, N.D., in 1929 was the first to list seed for sale in a commercial catalogue. The first concentrated breeding programs of more recent years in the United States were started after the U.S. Department of Agriculture obtained increased appropriations for grass breeding in 1935. The first 2 locations to do intensified breeding work on crested wheatgrass were Mandan, N.D., and Bozeman, Mont. The early work in Canada was concentrated at Saskatoon, Sask.

Adaptation and Importance

Crested wheatgrass is ecologically well adapted to much of the western United States. Its original native area of distribution covers huge portions of the U.S.S.R. and of other central Asian countries (Konstantinov 1923; Nevski 1934; Newell 1953; and Dewey and Asay 1975). Environmental conditions there are similar to those where it is being successfully grown in North America. In the United States, crested wheatgrass is well adapted to the northern Great Plains and westward to the Sierra Nevada Mountains (Rogler 1960). It is a good forage producer and persists well in the big sagebrush zones, in park areas of ponderosa pine zones, in pinyon-juniper woodlands, and in openings of mountain shrub. In the southern part of its range, it has been successful only at elevations of 1,500 to 2,700 m (about 5,000 to 9,000 ft). Within its area of adaptation are many small areas—high elevations, mountain meadows, and irrigated lands—where it has not persisted.

Because it utilizes soil water effectively and because it becomes dormant in hot, dry weather, crested wheatgrass is extremely drought resistant. It has been most successful in areas that receive 23 to 38 cm (9 to 15 inches) of precipitation annually. In the southern part of its range it needs a minimum of 30 cm (12 inches) of precipitation annually.

Crested wheatgrass survives extremely low temperatures. No established stands are known to have been killed by extremes of cold as low as -51°C (-60°F). It is adapted to many soil types; it produces well on most productive soils from sandy loams to heavy clays and is moderately tolerant to saline soils.

In addition to its wide adaptation and drought and cold resistance, the grass has many other virtues that have made it unusually successful in this country. It has long life and persistence under adversity and abuse, strong competitive ability, ease of establishment, high productivity for forage and pasture, excellent palatability and nutritive qualities during the spring and early summer, good seed production, seedling vigor capable of allowing it to volunteer, ease of harvesting and processing seed, and relatively few disease problems. Few if any grasses in its area of adaptation have so many desirable characteristics. Even so, there is great room for improvement of crested wheatgrass in lengthening the season of use; in increasing seed size, seed quality, and seedling vigor; and disease and insect resistance.

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