



Crop Science Report

RESEARCH/EXTENSION

KENTUCKY BLUEGRASS SEED PRODUCTION

by Harold Youngberg¹

Adaptation and Use

Bluegrass (*Poa pratensis* L.) is a very important and widely distributed grass throughout the temperate zone. Kentucky bluegrass is used as cool-season turf grass because it is a long-lived perennial with wide adaptation. Kentucky bluegrass forms a medium textured green turf of good leaf density. It has an aggressive sod-forming characteristic as a result of vigorous rhizome development. Kentucky bluegrass is capable of surviving extended drought periods and then initiate new shoot growth from underground rhizomes and older crowns when moisture conditions become favorable.

Kentucky bluegrass has been the standard of turf quality of many areas of the U.S. Newly released varieties provide improved disease resistance and other characteristics not present in earlier varieties.

Recently releases of turf-type perennial ryegrass varieties have made inroads on certain bluegrass uses. However, bluegrass has many advantages that will assure it a strong place in the market in the future.

In the past, Kentucky bluegrass was also considered an important pasture grass in North America. It is still often included in pasture mixtures for parts of the humid pasture region of the eastern United States. However, its low mid-season forage yield, aggressiveness in mixtures, and its high fertility requirements limit its wider use as a forage grass.

Bluegrass grown in Oregon is primarily for seed production. Oregon produced 36% of the nation's bluegrass seed in 1980. Linn and Marion counties have the largest acreage with other centers of production in Jefferson, Union and Jackson counties.

Adaptation

Bluegrass is adapted to the cool, humid climate of the northern half of the U.S. It is found in moist, well-drained soils, growing in meadows, pastures, fields and open woods. It grows best on soils with a medium texture, high fertility and a neutral pH.

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Areas of Seed Production

At the turn of the century, Kentucky produced the bulk of the Kentucky bluegrass seed. During the next 50 years, seed production shifted to states west of the Mississippi River. The seed from both regions was harvested from pastures and the annual harvest varied according to the price. The McCormick Seed Stripper was used in the Kentucky region and a rotary drum-type harvester was used west of the Mississippi River. Seed yields were not high, and care had to be exercised in curing the stripped seed or viability and seed quality could easily be lost. An increase of insects and diseases in the region caused lower seed yields. Later, development of improved varieties that could not be produced in areas of "common" type bluegrass and a demand for high quality seed caused a shift of seed production to the Pacific Northwest states.

The development and release of Merion Kentucky bluegrass represented the first major improvement in bluegrass. It was first grown for seed in quantity in Oregon in the mid 1940's. The Northwestern states had the advantage of not generally producing common bluegrass and were, therefore, free of volunteer contamination. Seed production practices were quite different from those of the eastern and central regions that harvested by stripping. The new production system resulted in higher yields, freedom from weeds, higher viability and better seed quality.

Bluegrass seed production has now shifted to the three Pacific Northwest states which in 1980 produced nearly all of the U.S. crop. Annual production is, on the average, evenly divided between Oregon, Washington and Idaho.

The demand for bluegrass seed has continued to grow. Many new varieties have been released by public plant breeders and more recently by private plant breeders.

Cultural Practices

Field Selection

Proper selection of the field to be planted to bluegrass is a very important step in quality seed production. Two or three year advance planning is necessary to control weeds and common bluegrass. In climates and soil where bluegrass is adapted, the seeds and plants can persist for several years, even under another crop. Therefore, cropping patterns and herbicide programs during the years out of bluegrass need careful attention to avoid contamination of the seedling field.

Annual bluegrass (Poa annua) and annual ryegrass (Lolium multiflorum) are grasses that cause problems in bluegrass crops. Perennial weeds such as quackgrass (Agropyron repens) and Canada Thistle (Cirsium arvense) must be controlled before establishing a field for seed production.

Common bluegrass in fence rows and roadsides can be sources of field contamination. Also, in irrigated areas, ditch banks are sources of seeds in irrigation water which must be dealt with.

Soil Type

Bluegrass is adapted to soils that are moderately too well drained, medium textured with high fertility and near neutral pH. Good crops have been grown on peat soils. Irrigation is essential in the arid areas of central and eastern Oregon, and may increase seed production of medium to late maturing varieties in western Oregon.

Moderate temperatures are desirable. Reduced seed production can be expected if temperature during anthesis exceeds 90° F. Late season frost may damage seed set.

Stand Establishment

Bluegrass is planted in drilled rows which has several advantages. The plantings produce higher seed yields for a greater number of years. Weed control and roguing is easier. In western Oregon, 12 inch wide rows have produced higher seed yields than 30 inch rows, particularly in the first two crops. In irrigated areas, 6 - 12 inch rows are common.

Bluegrass seed is slow to germinate and root. This delay and lack of competition with weeds during the seedling and establishment period presents a major problem in seed production.

Time of seeding is important to developing a uniform stand and rapid emergence. When the soil is warm, bluegrass seed will germinate quite rapidly, reducing weed competition. Cold soils result in slower germination and reduced stand (below 42° F minimum).

Fall seedings (September 15 or later) can be expected to produce little seed during the first season because of inadequate time for establishment and tillering before growth stops for the winter. Therefore, spring (May or June) plantings or mid-August to mid-September planting (with ample irrigation to obtain rapid germination) are preferred.

Bluegrass seed is very small (2.2 million/pound); therefore, seeding rates can be quite low and still get a good stand. However, good equipment is needed to obtain proper rate and seed placement. Fields planted at 1-2 lbs in 12 inch rows have produced good stands. Lower rates per acre can be used with wider row spacing. One pound of Merion bluegrass seed per acre in 12 inch rows will place 32 seeds per foot of drill row. Seed should be planted at no more than 1/4 inch depth in a smooth firm seedbed.

Irrigated in dryland areas

Irrigation is necessary when bluegrass is grown in central and eastern Oregon because bluegrass plants are fairly shallow-rooted (18 inches). Therefore, frequent irrigation is necessary to keep adequate moisture in the effective root zone. The frequency and amount of water to be applied at each irrigation will depend upon the water-holding capacity of the soil in active root zone.

Having control of moisture supply can be a very beneficial tool in managing bluegrass for seed production, as it will provide the grower some control over growth. Since maximum seed production is dependent upon vig-

orous tiller development in the autumn, bluegrass should be irrigated by September 1 (in central Oregon) and kept well supplied with moisture to keep plants in a growing condition during the autumn months. This will develop large tillers with stored reserves to stimulate vigorous spring growth and reproductive tillering.

Careful management of irrigation during and after flowering is also important to maximum seed yields. Plants should show no signs of moisture stress until after seed maturity. Irrigation should be continued until near harvest.

Following harvest, irrigation should be reduced to a minimum. Summer irrigation should be timed in conjunction with post-harvest burning to assure that the crown is neither overly wet that the thatch will not burn, nor so dry that severe burning of the crown damages tillers. In some situations, summer irrigation can be discontinued.

Fertilization

Bluegrass seed yields and plant growth respond very positively to nitrogen fertilizer. Best results are expected from some fall application because of the importance of autumn growth on seed yields. Split fall and spring applications are most effective. Spring application of nitrogen only, tends to produce less seed yield and result in excessive lodging.

Nitrogen rates are somewhat dependent upon the age of the stand with older stands requiring higher rates. Heavy nitrogen applications on older stands will tend to overcome the tendency for lower yields as the stand ages.

Rates of 100 lbs actual nitrogen per acre split half autumn and half spring are suggested for the first two years with 125 to 150 lbs total for the third and later years.

Phosphorus and potassium should be used as indicated by soil tests. (Table 1).

TABLE 1
PHOSPHORUS AND
POTASSIUM APPLICATIONS

<u>Soil Test</u> (ppm)	<u>Application</u> (lbs/acre)
<u>Phosphorus</u>	<u>P₂O₅</u>
0-15	40-60
15-30	30-40
Over 30	None
<u>Potassium</u>	<u>K₂O</u>
0-100	60
Over 100	None

Sulfur at a rate of 7-15 lbs per acre should be applied annually in western Oregon. The sulfur may be supplied in combination with the nitrogen treatment.

Lime should be applied prior to seeding on soils with a pH below 5.8.

Weed Control

Careful field selection for freedom from weeds particularly annual bluegrass and volunteer common bluegrass is very important to seed production. Since the primary bluegrass seed market is for high quality turf, the presence of any contaminant is very detrimental.

Weeds seeds germinate much more rapidly than bluegrass and compete strongly with the crop, particularly during the first year. Selection of a clean field and care during establishment can save expensive weeding and roguing costs at a later time.

Once established, annual weeds can be controlled by autumn and spring herbicide treatments. (See Table 2).

TABLE 2
ANNUAL WEED CONTROL IN BLUEGRASS (WESTERN OREGON)

<u>Chemical</u>	<u>Rate</u>	<u>Comments</u>
Diuron	2-4 lbs 80% product (1.6-3.2 lbs ai) per acre	Apply in fall as soon as fall rains start germination of weed seeds, usually before mid-November. Spray only well established stands.
IPC or CIPC	3 lbs 80% product	Apply after first fall rains and prior to November 1. Use IPC only during rainy weather when soil is moist and temperatures low.
Ethofumestate - Nortron	1.0-1.5 lbs ai/acre	Apply to moist soil surface after rains start.
Terbacil - sinbar	0.5-1	Apply in fall after fall rains start germination of weed seeds and before weeds are well established. Apply only to well established fields

Broadleaf weeds may be controlled with 2,4-D at 0.50-0.75 lbs ai per acre or Dicamba at 0.25 lbs ai per acre. These materials are applied alone or in combination. Spray applications for broadleaf control are made in the spring. New spring seedlings should not be sprayed before the grass has 5 leaves.

Insect & Disease Control

Field sanitation by burning post-harvest residue or flaming fields after straw has been removed is the most effective method for control of major insect and disease problems. Controls for major bluegrass insect and disease problems are summarized in Table 3.

TABLE 3
Insect and Disease Problems in
Bluegrass in Oregon

<u>Insect</u>	<u>Symptoms</u>	<u>Control</u>
"Silver top" (produced by plant bugs)	White inflorescence associated with shrunk stem above upper node; seed is sterile.	No registered chemical. Post-harvest burning of residue.
<u>Disease & Other</u>		
Rust. <u>Puccinia</u>	Yellow or orange-red pustules on leaf, stem and panicles.	Burn stubble and straw in the field. Spray plants during growing and flowering. See current edition of <u>Pacific Northwest Plant Control Handbook.</u>

Bluegrass varieties vary in resistance to disease. Stem rust (Puccinia graminis poae) and yellow strip rust (Puccinia glumarum) have caused serious losses. Recommended control measures are listed in Table 3. Powdery mildew (Erysiphe graminis) has also caused yield losses on some varieties in central and eastern Oregon.

Disease infection can develop rapidly and result in severe losses. Fields must be checked frequently during the growing season.

Harvest

Varieties differ in maturity dates. Losses from shattering can be significant if harvest is delayed.

The crop should be swathed when the seed moisture reaches 28 percent and allowed to cure in the windrow for 10 days before harvesting with a combine equipped with a drapper pickup.

Combining very dry material at high cylinder speeds can result in hulling. Care must be taken to adjust the combine to prevent losses of unthreshed heads and spikelets. These must be returned to the cylinder for rethreshing.

Some growers modify combines to provide a second cylinder to rethresh seed. In some cases, rerunning the threshed straw has been successful, when the combine was poorly adjusted for the first run.

Seed Conditioning

Before seed conditioning, seed should be re-machined to complete the threshing process and remove the lint or wool from the seed which will interfere with screening. A modified hammermill or debearder is used in the cleaning line for this purpose.

Post Harvest Management

The care of established stands after harvest will greatly affect seed yields in the following year. The complete removal of straw and chaff is extremely important. This residue has some feed value (Youngberg & Vough, 1977) particularly if baled immediately after harvest. Note: Residue from fields treated with pesticides should not be used for livestock feed.

Open burning of the uniformly spread straw is the most common method of straw disposal in the seed production areas. Fields should be burned as soon after harvest has been completed and plants under the swath have dried. A hot fire is necessary for removal of residue and thatch that tends to build up in older stands and cause lower seed yields.

Thatch, a zone of tightly layered dead stems, leaves, and roots intermingled with living roots and stems developed above the soil surface as the bluegrass stand ages. Varieties differ in their tendency to develop thatch. Thatch development of 7.2 t/A developed after one year and 55.2 t/A after four seed crops in eastern Washington (Canode and Law, 1979). High temperature open burns reduced thatch development by 50%.

The development of a thatch causes tillers to form roots within the thatch layer rather than penetrating the soil. These plants are more subject to injury by heat, drought, or cold. They cannot take full advantage of the soil fertility and may be subject to disease and insect injury. These weakened plants develop small tillers with inadequate stored reserves and many remain vegetative, producing no seed.

To date, no mechanical method has been developed to reduce thatch or maintain seed yield in bluegrass other than burning.

Surface mechanical removal of residue such as crew cutting fails to affect the thatch. Mechanical tillage or renovation treatments cause severe injury to rhizomes and significantly reduce seed yields in the following season.

Burning thins the stand providing open areas for rhizome development resulting in greater tiller development and better seed yield.

Autumn growth and tiller development is extremely important to seed yield. Rhizome development is most rapid during warm conditions with tillers forming as soil temperatures decline. Autumn irrigation and fertilizer timing should be planned to develop the optimum number of large tillers before winter stops growth. This condition results from active plant growth favored

by adequate nitrogen, soil moisture and open space for growth (freedom from thatch or inter-row space).

Normal post-harvest management does not produce excessive autumn growth. Clipping autumn growth results in reduced seed yield.

Cost and Return

An estimate of establishment and production costs for bluegrass seed production for Willamette Valley counties was made in 1979. Costs for the establishment year were \$328.15 per acre. Based on an estimated 8-year stand life, annual production costs were \$447.10 per year or \$63.85 per 100 lbs of seed, assuming a 700 lb per acre seed yield.

References

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