

RELEASE NOTICE
OF
GARNET GERMPLASM MOUNTAIN BROME, BROMUS
MARGINATUS

AS

A tested class mountain brome with emphasis on head smut resistance, longevity and seed production

by the

UPPER COLORADO ENVIRONMENTAL PLANT CENTER (UCEPC)

and the

USDA - NATURAL RESOURCES CONSERVATION SERVICE

and the

COLORADO STATE AGRICULTURAL EXPERIMENT STATION

and the

MONTANA STATE AGRICULTURAL EXPERIMENT STATION

and the

WYOMING STATE AGRICULTURAL EXPERIMENT STATION

This announces the release of Garnet mountain brome (Bromus marginatus Nees ex Stued, PLANTS Data base, USDA - Natural Resources Conservation Service, also Hitchcock, A.S. 1950. Manual of the Grasses of the United States. 2nd Edition revised by A.Chase.) The identification was confirmed by Colorado State University, Department of Bioagricultural Sciences and Pest Management, Identification and Diagnostic Service. Garnet was selected for its head smut resistance, longevity, ease of establishment and good production of both forage and seed.

Application for Approval of a Cultivar

1. **Crop:** Mountain Brome, Bromus marginatus. See attached release information.
2. **Experimental numbers:** M-1236 (Bridger, Montana) - 9005308.
3. **Pedigree and history:** Collected in Powell County Montana near ghost town of Garnet. Tested at Meeker, Colorado and Bridger, Montana plant material centers and Bozeman, Kalispell, Moccasin and Missoula, Montana, Idaho Falls, Idaho, Pinedale, Wyoming and Scottsbluff, Nebraska. Tested class seed is produced in Meeker, Colorado from 1994 to present. No genetic manipulation - natural selection.
4. **Description:** Mountain Brome is considered a short lived perennial cool season bunchgrass of the C3 type (Wasser, 1982). It is native to the mountains and foothills of the Rocky Mountains and Pacific Coast regions (Stefferd, 1948). It does well on 18 inches or more of annual precipitation and grows at elevations from 5,000 to 10,000 feet (1,525-3,050 meters) [(Wasser, 1982 and Herzman, et al., 1975)]. It has been noted to interbreed with California brome (B. carinatus) and foothills brome (B. polyanthus) when found in close proximity (Wasser, 1982). Sheaths and leaves are normally pubescent and panicles are open. Mountain brome does well on moderately deep fertile medium textured soils (Wasser, 1982). It has a deep well branched root system that is important for protecting erodible slopes (Hanson, 1972). Mountain brome starts growth in early spring and is an important palatable forage for wildlife and all livestock. It has large seeds with good seedling vigor, but seeds do deteriorate rapidly in storage. Mountain brome has approximately 71,000 seeds per pound. In comparison, 'Garnet' mountain brome has 77,879 seeds per pound (seed count by Colorado Seed Laboratory on the 1998 seed lot).
5. **Location where developed:** Meeker, Colorado and Bridger, Montana plant material centers.
6. **Participating scientists:** Dr. Gary L. Noller, John Scheetz, Mark Majerus, Dan Ogle and Larry Holzworth.
7. **Superior/inferior traits:** Superior to other mountain bromes for head smut resistance and longevity, also is equal or superior to other mountain bromes for ease of establishment forage and seed production. No inferior traits noted.
8. **Method of propagation:** By seed through tested class seed from Meeker plant materials center.
9. **Amount of stocks available:** See number 10.
10. **Seed Stocks available:** Approximately 1300 pounds of tested class seed is available from Meeker plant materials center, plus 1999 harvest (not processed).

11. **Bud material:** Not applicable.

12. **No difficulty is expected in the production of any class of seed:** The only seed production problems noted at Meeker were, in the 1989 planting (08S191) and the 1993 planting (08S217) Diuraphis (Holcaphis) tritici (Gillette) western wheat aphid and Diuraphis nodulus (Richards) were noted, and in some cases did cause damage (Hammon, 1998). In addition, downy mildew [Sclerophthora macrospora (Sacc) T.S. & N.] has been noted in a few years in both of these plantings (08S191 and 08S217) and when present with Diuraphis spp. they did substantial damage.

13. **Suggested name:** Garnet for ghost town near collection site.

14. **Names approved by the cultivar release committee.** Garnet


15. **Form of release and intellectual property protection:** Tested Class release. Joint release as described in the Upper Colorado Environmental Plant Center release notice.

16. **Other considerations relative to mode of reproduction and isolation of seed fields:** From a telephone conversation with Mary Barkworth - Utah State University, Herbarium, she indicates that mountain brome seems to have both self fertilized and cross fertilized plants within the species. She indicated that rarely are species 100% self or cross fertilized. With this as a guide, we recommend 900 feet isolation for seed fields from other bromes (Bromus spp.).

Plant Variety Protection will be obtained. ____ Yes ____X____ No

RECOMMENDED BY:

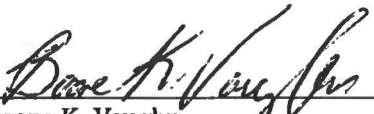

Originating Scientist Date


Department Head Date



Chairperson, CRC Date


Director, CAES Date


SIGNATURES FOR RELEASE OF
Garnet germplasm mountain brome grass (Bromus marginatus)


Boone K. Vaughn
President Administrative Board
UCEPC
Meeker, Colorado

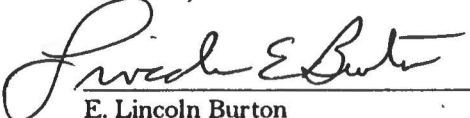
10/21/99
Date


Steve Black
State Conservationist
NRCS
Lakewood, Colorado

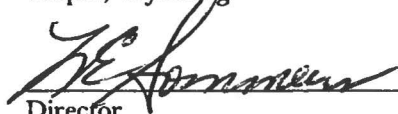
10/15/99
Date


Shirley Gamman
State Conservatinist
NRCS
Bozeman, Montana

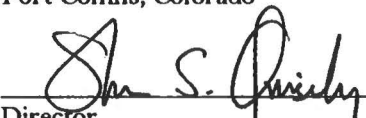
Date


E. Lincoln Burton
State Conservationist
NRCS
Casper, Wyoming


3-14-2000
Date


Director
Colorado State Agricultural Experimental Station
Fort Collins, Colorado

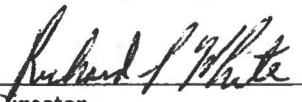
10/1/99
Date


Director
Montana State Agricultural Experimental Station
Bozeman, Montana

2/25/00
Date


Director
Wyoming State Agricultural Experimental Station
Laramie, Wyoming

3/27/00
Date


Director
Ecological Sciences Division
NRCS
Washington, DC

4/28/00
Date

ORIGIN:

Garnet mountain brome (9005308, M-1236) was collected in Powell County, Montana, near the ghost town of Garnet, at an elevation of 5,800 feet (1,770 m). This elevation is near the lower limit of the range for the species. In an Initial Evaluation Planting (IEP) in Montana, it exhibited better overall vigor and longevity than 'Bromar', which is relatively short lived and has a head smut problem. Head smut when present in the seed head produces smut instead of seed. Threshing spreads the spores to healthy seed increasing the presence of smut in the next generation. Head smut can be controlled by seed treatment but resistance through selection is the only practical means of controlling the disease (Stefferd, 1948).

DESCRIPTION:

Mountain brome is considered a short lived perennial cool season bunchgrass of the C3 type (Wasser, 1982). It is native to the mountains and foothills of the Rocky Mountains and Pacific Coast regions (Stefferd, 1948). It does well on 18 inches or more of annual precipitation and grows at elevations from 5,000 to 10,000 feet (1,525-3,050 meters) [(Wasser, 1982 and Herzman, et al., 1975)]. It has been noted to interbreed with California brome (*B. carinatus*) and foothills brome (*B. polyanthus*) when found in close proximity (Wasser, 1982). Sheaths and leaves are normally pubescent and panicles are open. Mountain brome does well on moderately deep fertile medium textured soils (Wasser, 1982). It has a deep well branched root system that is important for protecting erodible slopes (Hanson, 1972). Mountain brome starts growth in early spring and is an important palatable forage for wildlife and all livestock. It has large seeds with good seedling vigor, but seeds do deteriorate rapidly in storage. Mountain brome has approximately 71,000 seeds per pound. In comparison, Garnet mountain brome has 77,879 seeds per pound (seed count by Colorado Seed Laboratory on the 1998 seed lot).

DEVELOPMENT:

Garnet mountain brome was initially tested at the Bridger Plant Materials Center in Montana. In a planting (planted April 11, 1977) at Bridger, Montana, the stand of Garnet ranged from 90% to 100% and was better than the other mountain brome in the study. In 1979 (the last year of the study) moderate vigor, and production of both forage and seed was recorded for Garnet, which again was generally better than the other mountain brome in the project (see APPENDIX I).

In a planting (seeded October 26, 1983) at Missoula, Montana, the stand of Garnet ranged from 90% to 100% and in 1988 exhibited good vigor and good production of both forage and seed. The performance of 'Bromar' in the project was not as good as Garnet (see APPENDIX II). In a second planting (seeded April 14, 1987) at Missoula, Montana, the stand of Garnet mountain brome ranged from 25% to 50% and had moderate vigor in 1990, the last year of the study. In this test 'Bromar' in 1990 had a better stand than Garnet (see APPENDIX II).

Garnet mountain brome was included in forage production plantings (1993, 1994, & 1995) at four locations (Bridger, Bozeman, Kalispell and Moccasin) in Montana. The average

forage production for Garnet ranged from 1.36 to 4.86 tons per acre. In each location Garnet produced less forage than 'Regar' meadow brome (see APPENDIX III).

In an initial evaluation project (08I046D, 1980 - 1983) at the Meeker Plant Materials Center, 55 accessions of mountain brome were examined. Garnet was selected as one of the top four accessions based on disease resistance, longevity, ease of establishment and production of both forage and seed.

In 1984 the top five accessions from project 08I046D were evaluated for head smut resistance and seed production. Garnet was the top performer in the project. However, it should be noted that although Garnet was the top seed producer, it was also the only accession receiving supplemental water (from sprinkler drift). Two of the top five accessions were combined because of limited seed and proximity of collection. The remaining two accessions displayed poor emergence and weak stands and were destroyed in 1985. 'Bromar' mountain brome was not one of the top five accessions but was included in the four year project and was dead after the second winter.

In 1989 Garnet mountain brome was planted in a space planting (08S191) at the Meeker Plant Materials Center. Off types were removed and seed was produced for a seed increase planting. In 1993 a one acre seed production field (08S217) was established. This field continues to produce seed (July, 1999). Five years of seed production from this field probably indicates that Garnet has improved longevity over other mountain bromes. Based on the five years of seed production (1994 through 1998) yields have averaged 812.6 pounds of clean seed per acre (see APPENDIX IV).

Certain seed production problems have been noted for Garnet through the years at the Meeker Plant Materials Center. In the 1989 planting (08S191) and the 1993 planting (08S217) Diuraphis (Holcaphis) tritici (Gillette) western wheat aphid and Diuraphis nodulus (Richards) were noted, and in some cases did cause damage (Hammon, 1998). In addition, downy mildew [Sclerophthora macrospora (Sacc) T.S. & N.] has been noted in a few years in both of these plantings (08S191 and 08S217) and when present with Diuraphis spp. they did substantial damage.

In 1996 in project 08S217, head smut was noted (at only 1% or less) in Garnet mountain brome. In 1997 and in 1998 in the same seed field head smut was present with only a few plants in the one acre field. The identification of head smut (Ustilago bullata) was confirmed by Colorado State University, Department of Bioagricultural Sciences and Pest Management, Identification and Diagnostic Service.

In a dryland field test in Idaho Falls, Idaho (1996-1998), Garnet maintained an excellent stand and vigor rating. Seed production averaged 325 pounds per acre for 1997 and 1998 (see APPENDIX V). Some head smut was noted during years with very abundant spring moisture.

Garnet mountain brome was included in a cool season forage production test with other bromes and orchard grasses in Scottsbluff, Nebraska in 1997 and 1998. Seed production in

1998 was 600 pounds per acre for Garnet while 'Regar' meadow brome produced 520 pounds of seed.

In a 1991 demonstration planting at Pinedale, Wyoming (elevation 7,450 feet), nine mountain brome accessions were planted, including 'Bromar' and Garnet. In 1995 all mountain brome grass stands decreased from the previous year. However, Garnet declined the least and was still maintaining a 75% rating, while 'Bromar' rated only 1%. In 1996, stands of mountain bromes had continued to decline, 'Bromar' was dead, Garnet had only a 10% stand and three of the nine mountain bromes had a better stand rating, ranging from 23% to 55% (see APPENDIX VI).

Results from a replicated fall planting that included Garnet and 'Bromar' mountain bromes at Coyote draw in Utah, showed that Garnet had a 40% stand while 'Bromar' had only a 20% stand.

In 1998, seed lots of Garnet grown at the Meeker Plant Materials Center that were 10 to 13 years old were tested for germination. These small lots had not been tested in the years grown, but in 1998 the germination percentages were all poor, ranging from 0% for the 13 year old material, to only 5% for the 10 year old lot (see APPENDIX VII). Other seed lots of Garnet mountain brome that were tested when produced, had germination percentages that deteriorated rapidly. A 1994 lot had a germination of 77% at time of production, but in two years (1997) germination had declined to 64%. Another lot produced in 1990 had a germination of 83% at the time of production, but in six years (1997) was only 25% (see APPENDIX VII). This information demonstrates that Garnet seed can not be stored for long periods due to loss of germination.

USES:

Garnet should provide good performance where traditional mountain brome has been historically present. This includes planting for quick cover and erosion control in mountains and foothills (Plant Materials Handbook, 1988). It is also used in seeding mixtures with alfalfa and sweet clover to revegetate livestock and big game ranges, to protect road cuts and fills, mined lands and burned over forestlands (Wasser, 1982 and Stefferud 1948). It is a quick establishing species which provides initial soil stabilization when planted with other slower establishing natives. As slower developing species become established, the stands of the short-lived mountain brome will slowly decline. Mountain brome grass is considered a pioneer species on disturbed sites and a decreaser species in the range sites it occupies. It is commonly found in Major Land Resource Areas (MRLA) Northern Rocky Mountains and Valleys (44 & 45), Northern Rocky Mountain Foothills (46), Wasatch and Uinta Mountains (47), Southern Rocky Mountains Parks (48B), and Southern Rocky Mountain Foothills (49) [(Long Range Plans for field Plantings and Planting Guides, Section 540.25 (B) and (C) January 1997)].

AREA OF ADAPTATION:

Garnet mountain brome is adapted to areas with 15 inches or more of annual precipitation in the foothills and mountain zones of the Rocky Mountains. Garnet was collected at an elevation of 5,800 feet (1,770 meters) and has not been tested at elevations higher than Pinedale, where the species does occur (10,000 feet). Mountain brome grass prefers

deep fertile, and mesic soils of medium to fine texture. It can survive on thin, dry, or coarse soils, but at a reduced level of production. Mountain brome grass grows throughout the mountain areas of the Pacific Northwest, thriving in climates with cool, dry summers and good winter precipitation. This grass does not tolerate a high water table or flooding, but has good tolerance of shade, fair tolerance of fire, and is very winter hardy. This species has excellent seedling vigor and establishes quickly, often producing seed the year of establishment. Stands of mountain brome depend on natural reseeding for its self perpetuation (Long Range Plans for Field Plantings and Planting Guides, Section 540.25 (B) and (C) January 1997).

MAINTENANCE AND CERTIFIED SEED PRODUCTION:

It is expected that official state seed certification agencies will certify seed production fields. Tested class seed of Garnet mountain brome can be obtained from the Upper Colorado Environmental Plant Center, Meeker Colorado. Seed production fields of Garnet mountain brome will be limited to having less than 5% head smut. This will eliminate the possibility of seedlings with no smut resistance from becoming a substantial part of the seed production stand. UCEPC will maintain G1 (generation 1) seed and seed will only be certified and distributed as a G1. So, Garnet will be limited to one generation of tested class seed beyond G1. G2 seed will be sold for only commercial seed stock for conservation use.

ENVIRONMENTAL CONCERNS:

In the development for release of Garnet mountain brome no invasive tendencies were noted or reported. The test results we have to date indicate that Garnet germplasm has not been invasive in its areas of adaptation or for its intended use.

SEED PRODUCTION:

An irrigated seed production field at the Meeker Plant Materials Center was established with a three foot row spacing and planting about 30 seeds per foot of row at a depth of about one half inch. A fall application of fertilizer at a rate of 90 pounds of available nitrogen per acre is applied at Meeker. However, a soil test is recommended to determine fertilizer needs for most seed production fields. Good seed production can be expected the year following a spring, late summer or fall planting. Seed production fields of Garnet mountain brome will be limited to having less than 5% head smut. This will eliminate the possibility of seedlings with no smut resistance from becoming a substantial part of the seed production stand. Seed fields should be monitored for insects, mildew and head smut. Seed at Meeker has been harvested with a combine from a standing crop and dried before cleaning and storage. The large seeds are easily cleaned with traditional seed cleaning equipment.

COMMERCIAL SOURCES:

Contact the Upper Colorado Environmental Plant Center, Meeker, Colorado for tested class seed for seed production fields. Contact can also be made through the Colorado Seed Growers Association, Fort Collins, Colorado.

LITERATURE CITED:

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