University of Idaho
College of Agriculture

Cooperative Extension Service
Agricultural Experiment Station

Current Information Series No. 738

Glacier Winter Peas

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'Glacier,' a new variety of winter peas, was released by the University of Idaho in 1982. Seventy-five percent of Glacier's parentage is from 'Common' Austrian winter peas, and 25 percent is from the spring pea variety 'Dark Skin Perfection.' Glacier was selected for semidwarf growth habit, increased disease resistance, winter hardiness, reduced seed dormancy and increased seed yield.

Glacier produces vines about 42 inches in length, compared to the 70-inch vines produced by conventional winter pea varieties such as Common, 'Fenn' and 'Melrose.' Glacier seed is similar in both size and color to Melrose and makes a high quality 'An Paste' product. The multiple disease resistance carried in Glacier should help stabilize both the yield and acreage of winter peas produced in the Pacific Northwest.

Seed Yield Potential

In trials conducted from 1979 to 1983, Glacier produced an average of 156 percent more seed than Fenn (Table 1). Sclerotinia white mold infection reduced the seed yield of Fenn and Melrose in both 1980 and 1981 at Moscow. Under these conditions, Glacier produced an average of 5,200 pounds of seed per acre compared to only 2,850 and 2,815 pounds per acre for Melrose and Fenn, respectively. Glacier is less susceptible to Sclerotina white mold because of its shorter vines.

In 1982, severe cold in late February drastically reduced stands, and none of the four varieties produced more than 200 pounds of seed per acre. In 1983, white mold again limited yields of the long vined varieties, and Glacier yielded 830 pounds per acre more than Melrose.

At Grangeville, Aphanomyces root rot reduced the seed yield of all pea varieties in both 1980 and 1981, and none of the lines produced more than 350 pounds of seed per acre (Table 1). In 1982 and 1983, Race 1 Fusarium wilt reduced average seed yields of Melrose, Fenn and Common to an average of 2,620, 2,275 and 1,935 pound per acre, respectively. In these same trials, Glacier produced an average seed yield of 2,900 pounds per acre.

In 1982, at Craigmont, the pea seedlings were damaged by Ascochyta blight, and Glacier yielded more than both Melrose and Fenn (Table 1). Because of short vines, however, Glacier probably could not have been commercially harvested at this location without the use of a pea bar.

Disease Resistance

Glacier has shown resistance to Race 1 Fusarium wilt in trials conducted at both Washington State University and the University of Idaho (Table 2). Race 1 wilt is gradually spreading throughout both the Palouse and Camas Prairies and completely kills susceptible varieties. Glacier is susceptible to both Race 2 and Race 5 wilt, but neither of these races occur in the winter pea production area.

In laboratory evaluations, Glacier has shown a level of tolerance to Ascochyta blight similar to that found in Melrose (Table 2). Foliar infection of Ascochyta blight at Moscow during 1981 and at Craigmont in 1982 did not significantly reduce seed yield of Glacier (Table 1).

Table 1. Seed yield of four varieties of winter peas grown in nine trials in northern Idaho, 1980-83.

Variety	Moscow				Grangeville				Craigmont	Variety	% of
	1980	1981	1982	1983	1980	1981	1982	1983	1982	average	Fenn
	lb/acre										
Glacier	4,340a*	6,060a*	140a*	3,290a*	830	165a*	3,670a*	2,135a*	1,895a*	2,500	156
Melrose	2,000b	3,700b	115a	2,460b	75	265a	3,180ab	2,055a	1,480b	1,700	106
Fenn	2,080b	3,550b	145a	2,340b	100	290a	2,510b	2,040a	1,380b	1,600	100
Common	—	3,270b	132a	1,770b	—	332a	2,250b	1,620a	1,610ab	1,570	89
Location average	2,810	4,140	133	2,465	335	260	2,900	1,960	1,590		

*Means within a column not followed by the same letter differ at the 0.05 level of probability by Duncan's new multiple range test.

Fig. 1. Field of Glacier winter pea in bloom at the University of Idaho Plant Science Farm new Moscow, 1983.

Glacier has good tolerance to white mold that can rot pea vines as they mature (Table 2). The shorter vines of Glacier combined with the tolerance of its spring parent should greatly reduce losses to this disease.

Aphanomyces root rot is a disease recently identified at Grangeville that has caused severe losses in wet sites on the Camas Prairie during recent years. It severely stunts pea seedlings and causes a complete loss of seed yield. Because all varieties of peas are susceptible to this soilborne pathogen and fungicides have been both ineffective and uneconomical, the best control is to avoid planting peas in wet sites with a history of root rots.

Fusarium root rot can cause losses to winter peas under compacted soil conditions, but most winter pea varieties including Glacier are tolerant to this disease because of their pigmented seed coats. Cultural practices that compact the soil should be avoided to prevent losses from this disease.

Table 2. Disease resistance of four varieties of winter peas.

Variety	Race 1 fusarium wilt	Ascochyta foot rot	Sclerotinia white mold
Glacier	resistant	tolerant	tolerant
Melrose	susceptible	tolerant	susceptible
Fenn	susceptible	tolerant	susceptible
Common	susceptible	tolerant	susceptible

Glacier and all varieties of winter peas are susceptible to pea enation mosaic virus (PEMV), pea leaf roll (PLR) and pea streak virus (PSV) that have infected both spring and winter pea crops in recent years. Damage in winter peas has generally been less severe than in spring peas.

Soil Fertility

Soil nutrient requirements of Glacier are similar to those of other varieties of spring and winter peas. Growers are urged to conduct soil tests in fields in which Glacier is to be planted to determine the available levels of phosphorus (P), sulfur (S) and micronutrients such as boron (B) and molybdenum (Mo). Those nutrients that are deficient should be added by incorporation of fertilizers before planting. Molybdenum is usually applied as a seed treatment. Details on interpreting soil test results and recommended fertilizer rates are available in CIS No. 448, *Northern Idaho Fertilizer Guide — Peas and Lentils.*

Growers should not apply nitrogen fertilizers or plant in fields with high levels of nitrogen since this nutrient reduces both the winter hardiness and the amount of nitrogen fixed by the pea seedlings. Growers are encouraged to apply commercial *Rhizobium* inoculum when seeding Glacier to ensure a high population of effective bacteria and sufficient nitrogen fixation.

Field Management

Avoid planting Glacier winter peas in poorly drained fields or in fields with heavy straw residue on the soil surface. Poor drainage and heavy residue, particularly wheat straw, can reduce stands caused by the combined effects of poor soil aeration and the release of toxic products from the decaying straw. Excess straw should be incorporated or partially removed before planting to reduce this damage. Glacier will produce optimum yields when planted after barley.

Working the soil when it is too wet can cause crusting and excessive cloddiness that will reduce the emergence of winter peas. Soil compaction which results from working wet soils can also increase losses from Fusarium root rot. The soil surface should have moderate amounts of straw and some moderate sized clods at planting to prevent excessive soil erosion during the winter months. With proper straw management, Glacier should do as well as other winter peas when grown under no-till and minimum tillage.

Seedling Emergence and Vigor

Glacier winter pea seedlings emerge more rapidly than Melrose, but full stand development may be delayed because of the hard seed characteristic of Glacier. Seedlots of Glacier with high levels of hard seed such as the one tested in 1981 to 1982 may have thicker stands in the spring than in the fall (Table 7). The later emerging seedlings will be smaller and more susceptible to pea leaf weevil attack in the spring. To prevent pea leaf weevil damage on the small, late emerged, pea seedlings as well as the larger seedling that emerged earlier in the fall requires careful timing of chemical control. Seedlots of Glacier with a low amount of hard seed may have thinner spring stands than fall stands because of normal plant loss that occurs during the winter months.

Insect Control

Pea leaf weevil adults can be extremely destructive to Glacier winter pea seedlings. Damage in the spring appears as scalloped leaf edges and destroyed terminal growing points. Seeding in early September produces larger plants that are less susceptible to insect damage the following spring and easier to protect with insecticides. See CIS No. 227, *The Pea Leaf Weevil*, for additional details on this insect and recommended methods of control.

Table 7. The effect of seeding rate on plant establishment of Glacier at Moscow and Grangeville, 1981 to 1983.

Seeding rate	Plants established in field					
	Moscow 1981-82		Moscow 1982-83		Grangeville 1982-83	
	Fall	Spring	Fall	Spring	Fall	Spring
(seeds/ft)	plants/ft of row					
5	—	4	3	4	4	5
8	—	5	5	7	6	8
11	—	8	7	9	9	11

Pea aphids commonly occur on all pea varieties including Glacier. These aphids suck sap from leaves, stems, blossoms and pods and can multiply rapidly. When present in large numbers, aphids can cause stunting and reduce seed yield as well as transmit viral diseases. As with other problems, early fall seeding produces larger plants which are less susceptible to virus diseases. See your Extension county agent for additional information and recommendations on the control of aphids on peas and lentils.

Glacier, as well as all varieties of spring and winter peas, are susceptible to pea weevil. The pea weevil larvae infest pea seeds and reduce seed quality and viability. Seed lost during harvest and cleaning operations can be significant. Controlling adults during early bloom before egg-laying will prevent serious damage. See CIS No. 475, *Pea Weevil and Its Control*, for details on recommended insecticides and control action guidelines for this insect.

Weed Control

Because of its short vines, Glacier does not compete well with weeds. Special attention to weed control, therefore, is essential for successful production of Glacier. Fields to be seeded to Glacier should not have a history of severe weed infestation. For perennial weeds, treat with glyphosate (Roundup), 2,4-D or MCPA after grain harvest and before tilling the stubble (Table 8). Canada thistle can also be suppressed after peas and thistles emerge with MCPB (can-Trolor This-Trol) or MCPA.

Control of wild oats may include preplant incorporated triallate (Far-go), diallate (Avadex) or IPC (ChemHoe). Triallate or diallate, harrowed in after planting but before peas sprout, and barban (Carbyne) or dalapon, applied after wild oats have emerged, may also be used for control of annual grasses.

Winter annual broadleaf weeds can severely reduce the yields of Glacier. In production areas with cool springs, 2 gallons of dinoseb amine per acre should be applied preemergence to Glacier in the fall (Table 8). In areas with warm springs, a postemergence application of 2 to 3 quarts per acre of dinoseb amine has given good control. Because large weeds may survive this low rate, the herbicide should be applied before winter annuals become too large. Other registered herbicides can also provide control of broadleaf weeds. Trifluralin (Treflan) may be incorporated before planting and works well in combination with triallate or diallate. Metribuzin (Sencor or Lexone) may be applied before peas emerge to control both emerged or nonemerged weeds. This chemical will continue to control weeds until the crop is well emerged. MCPA and MCPB may be used for certain labeled broadleaf weeds after peas and weeds emerge; however, growth stage and temperature precautions on the MCPB label must be carefully observed. Glacier should be sprayed only with herbicides registered for use on peas.

As soil pH declines below 6.0, growers may want to consider the incorporation of 3 to 5 tons of ground limestone per acre. In the more acidic soils of the northeastern U.S., the application of limestone is essential to the production of all legumes. Present research indicates the effects of soil liming will last for several years and will improve yields of both pulse and cereal crops.

Seeding Dates

Plant Glacier during the first 3 weeks in September to get optimum yields (Table 3). Early planted pea seedlings are larger and more vigorous than late planted pea seedlings and, therefore, have greater tolerance to frost heaving, pea leaf weevil damage, temporarily saturated soils and infection by *Ascochyta* blight. The larger, more vigorous seedlings gained from early planting also help reduce soil erosion. Early planting also allows the pea plants to avoid hot weather at flowering that can reduce the yield of late planted peas.

Early planting Glacier seedlings are less tolerant to subfreezing temperatures than later planted seedlings. Without snow cover, air temperatures below 14° F may damage early planted Glacier seedlings more than Melrose seedlings. In trials conducted at Moscow and Grangeville, however, early seeding produced higher yields than later seeding (Table 3). In most years, early planting of Glacier will produce maximum yields. When late seeding is unavoidable, the seeding rate should be increased 1 pound for each day seeding is delayed after Sept. 15. Increased seeding rates will only partially compensate for late seeding.

Seeding Rates

Seeding rates should be 80 to 100 pounds per acre in the Grangeville area and 100 to 120 pounds per acre in the Moscow area (Table 4). Seeding rates will vary depending on seed size and percentage of hard seed in each seedlot (Table 5). As the number of seeds per pound decreases below 4,000 seeds, seeding rates must be increased to establish an optimum population of five to seven plants per foot of row. Similarly, seeding rates should be decreased as number of seeds per pound increases above 4,000 seeds. Growers should use either registered or certified seed that bears an Idaho Department of Agriculture seed tag to ensure varietal purity and seed quality.

The postharvest seed dormancy of Glacier is lost within a few months of harvest and can be broken immediately after harvest by seed scarification. The percentage of hard seed measured immediately after harvest has ranged from 8 to 23 percent depending on the year and location in which the seed was produced (Table 6). The percentage of hard seed will normally decline below 9 percent by late October. Hard seed content and delayed germination can reduce the number of seedlings emerging in the fall. Because seedlings established from late emerging seeds are less vigorous than early emerging seedlings, the seeding rate must be increased in proportion to the level of hard seed to ensure good stand establishment.

Table 3. The effect of planting date on seed yield of Glacier and Melrose winter peas at Moscow and Grangeville, 1982-83.

	Seed yield					
	Moscow			Grangeville		Variety average
Variety	9/14	10/8	11/12	9/23	10/22	
	lb/acre					
Glacier	4,800	4,025	3,825	4,150	2,800	3,920
Melrose	5,350	3,000	2,750	1,275	800	2,635
Average	5,075	3,512	3,288	2,712	1,800	

Table 5. Influence of seed size on recommended seeding rates.

Seed size	Recommended seeding rate+
(seeds/lb)	(lb/acre)
3,500	120
3,750	110
4,000	100
4,250	90
4,500	80

+Assumes 8 percent hard seed.

Table 6. Influence of time after harvest on hard seed and germination percentage of Glacier grown at Moscow, 1981 to 1983.

Date	Hard seed+	14-day germination
	(%)	(%)
1981 test		
Aug. 21	23	75
Sept. 24	18	77
Oct. 8	9	91
1982 test		
Sept. 3	17	67
Sept. 15	8	63
Oct. 27	8	73
1983 test		
Aug. 22	8	85
Sept. 5	2	91

+Seed showing no inhibition of water after a 14-day germination test.

Table 4. The effect of seeding rate on seed yield of Glacier winter peas at Moscow and Grangeville, 1981-82 and 1982-83.

	Seed yield						
	Moscow			Grangeville			Seeding rate average
Seeding rate	1981-82	1982-83	Avg.	1981-82	1982-83	Avg.	
	lb/acre						
105	6,500	5,500	6,000	5,800	3,850	4,825	5,400
175	7,250	6,300	6,775	5,600	4,200	4,900	5,850
245	5,850	6,300	6,075	5,700	4,350	5,025	5,550

Table 8. Herbicides registered for application on peas in Idaho in 1984. Growers should follow labeled directions carefully and ensure all agricultural chemicals have a current registration on peas.

Herbicide	Rate (ai/acre)	Guides on use (read and follow the label)
Weed problem: Annual broadleaf and grass weeds		
dalapon (Dowpon M)	¾ lb	Apply when annual grasses are small and when peas are 3 to 6 inches tall. Apply at least 25 days before harvest. Do not feed treated pea vine hay to livestock.
trifluralin (Treflan)	½ to ¾ lb	Apply preplant and incorporate thoroughly with rototiller or by disking and cross-disking. Injury to winter wheat planted after peas may occur if conditions are unfavorable for decomposition. Apply low rate on light and medium soils and higher rate on heavy soils.
metolachlor (Dual)	1½ to 3 lb	Preplant incorporated or preemergence treatment. Apply before weeds or crop emerge. Do not incorporate more than 2 inches deep. Crop injury may occur under abnormally high soil moisture conditions during early development of the crop. Do not graze or feed forage or fodder to livestock.
fluchloralin (Basalin)	½ to 1½ lb	Preplant incorporated treatment (cow peas, blackeyed peas, southern peas, field peas, garden peas). Apply and incorporate thoroughly into the top 1 to 2 inches of final seedbed within 8 hours of application. Avoid removal of treated soil from seedbed before or during planting as this may expose untreated soil and allow seeds to germinate. Do not plant sugarbeets, rye grass, small grains or sorghum on Basalin-treated land for 1 year after treatment as earlier planting may result in crop injury. Refer to label for specific details, rates, etc.
trifluralin + triallate (Treflan MTF + (Far-Go)	⅜ to ½ + 1¼ lb	Apply preplant and incorporate herbicides thoroughly within 8 hours to a depth of 2 to 2½ inches. Do not use where soils contain more than 5 percent organic matter. Do not graze or feed forage or fodder to livestock.
Weed problem: Annual broadleaf		
dinoseb (Vertac Selective)	¾ lb	Apply when peas are 2 to 6 inches tall or before pea flower buds appear. Allow peas to harden after cloudy or humid weather to prevent injury. Do not graze or feed treated forage to livestock within 6 weeks after spraying. Do not apply within 6 weeks of harvest.
bentazon (Basagran)	¾ to 1 lb	An early postemergence treatment to be applied when weeds are small and actively growing. Peas must have at least three pair of leaves (or four nodes) before treatment, or severe crop damage may occur. See label for temperature restrictions.
MCPB (Thistrol)	½ to 1½ lb	Apply when crop has six to 12 nodes but three nodes before flowering. Do not spray peas if they are stressed for moisture or when temperatures are over 90° F. Do not graze or feed forage from treated fields.
MCPA sodium salt or amine	⅛ to ⅜ lb	Apply after 4 to 6 inches tall and before first pea blossom. Do not graze or feed treated fields. Do not apply if peas are stressed by lack of moisture or when temperatures are above 90° F. Do not apply both MCPA and MCPB to the same crop of peas. Injury will result.
dinoseb amine (Premerge 3)	6 to 9 lb	**Preemergence** — See label for precautions and restrictions.
dinoseb amine	¾ to 2¼ lb	**Postemergence** — Apply before pea bloom when peas are 2 to 8 inches tall and weeds are small. Some foliage burn may occur, but normal recovery occurs within a few days. Apply only when crop foliage is dry. Do not graze or feed treated forage to livestock within 6 weeks after spraying.
metribuzin (Sencor, Lexone)	¼ to ⅜ lb	Apply preplant (not Lexone) or preemergence. Mechanical incorporation or rainfall is essential for weed control. Use the high rate on high clay or organic matter soils. Lexone 4L can also be applied postemergence (SLN). See label for additional precautions and restrictions.
Weed problem: Wild oats		
propham (ChemHoe)	4 lb	Apply before planting. Incorporate immediately into top 3 to 6 inches of soil. Plant as soon as possible; not later than 1 to 2 days after treatment.
triallate (Far-go)	1¼ lb	Apply before or after planting. Before planting: Incorporate with implements such as a roller harrow or field cultivator set to work no deeper than 3 to 4 inches. Limited to spring application only.
diallate (Avadex)	1¼	Apply before or after planting, and incorporate according to label directions. Limited to spring application only.
barban (Carbyne 2 EC)	¼ to ⅜	Apply when wild oats are in 2-leaf stage 4 to 9 days after emergence. Don't apply after peas reach 6-leaf stage. Do not graze. Apply in 5 to 10 gpa of water using 45 psi.
Weed problem: Annual and perennial weeds		
glyphosate (Roundup)	½ to 1½ lb ai	**Preemergence treatment** — Application must be made before peas emerge. Do not feed on forage crop within 8 weeks of treatment. Do not plant subsequent crops other than those listed on label for 1 year. Use ½ gal nonionic surfactant per 100 gal water with the ½ lb rate. See label regarding amount of water applied per acre. Up to 5 lb ai glyphosate may be used to control perennial weeds.

Pesticide Residues — These outlines for use are based on the best information currently available for each chemical listed. If followed carefully, residues should not exceed the tolerance established for any particular chemical. To avoid excessive residues, follow suggestions carefully with respect to dosage levels, number of applications and minimum interval between application and reentry or harvest.

To simplify information, trade names have been used. Neither endorsement of named products is intended nor criticism implied of similar products not mentioned.

Consult your Extension county agent, weed control officers or chemical dealers for current information on registered herbicides. Follow labeled directions carefully to minimize damage to Glacier and to ensure effective weed control.

Harvest

Glacier matures at the same time as conventional winter pea varieties and threshes easily. Because of the shorter vines and more determinate growth habit of Glacier, use of a pea bar will facilitate harvest and reduce seed loss. Combine settings of cylinder speed and concave clearance are similar to that for other winter pea varieties.

Because large clods or exposed rocks can damage combines during harvest, many growers have historically rolled winter peas in the early spring to reduce this hazard. If this rolling operation is done when the pea seedlings are frozen or when the soil is too wet, it can cause severe damage to the pea crop. When such an operation is needed, growers should consider harrowing or timing the spring rolling operation to minimize plant damage.

Marketing

Because Glacier seed has a similar size, shape, color and texture to Melrose winter peas, foreign consumers of winter peas should readily accept Glacier. Tests conducted in Japan on small seedlots have shown that Glacier makes a high quality An Paste. Other Oriental pea markets should also accept Glacier seed.

Because of its shorter vine growth and reduced dry matter yields, Glacier would probably not produce optimum yields of organic matter if grown as a green manure crop in either the Pacific Northwest or the southeastern U.S. Semidwarf peas such as Glacier, however, have been shown to be highly efficient in nitrogen accumulation. If Glacier is used as a green manure crop to comply with a government acreage allotment program, it will produce as much nitrogen per acre as conventional winter pea varieties. In fields with a history of either Race 1 Fusarium wilt or Sclerotinia white mold infectations, the total dry matter and nitrogen yield of Glacier could exceed that obtained by susceptible varieties such as Common or Melrose.

Acknowledgment — Funding for the development and testing of Glacier was provided by the Idaho and Washington Pea and Lentil Commissions, the University of Idaho Agricultural Experiment Station and the USDA, Agricultural Research Service, PULSE Grant. Plot ground was provided by Bob Smith at Craigmont and Roy Green at Grangeville. Mike Dial, Jerry Swensen, Chuck Huston, Dennis Schotzko, Carl Crabtree and Ed Mink provided technical support for this research.

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1500 5-84

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