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Importance of Quality and Size of Winter Pea Seed

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Austrian winter peas used for seed are not routinely tested for germination, the presence of seedborne diseases and are not screened for size before planting. Large variations in seed quality and size could exist among Austrian winter pea seed stocks and could influence plant establishment and eventual seed yield. These studies were conducted to determine the variability of quality existing in commercially harvested Austrian winter pea seed lots and to determine the influence of seed size on seedling vigor, plant populations and yield of Austrian winter peas planted on different dates at Moscow and Grangeville, Idaho.

Seed Quality of Austrian Winter Peas

Processed seed of 'Common' and 'Fenn' Austrian winter pea seed lots were obtained from 16 elevators in northern Idaho. Subsamples of each seed lot were germinated for 7 days using the rolled towel method of evaluation. Numbers of normally germinated seedlings, seed with delayed germination (root emergence only), hard seed and dead seed were counted. Separate seed samples were indexed for seedborne Ascochyta.

The germination percentage of the 16 seedlots varied from 65 to 94 percent (Table 1). Hard seed and seedlings having root emergence only were the largest contributors to reduced germination. Hard seed fails to absorb water or absorbs water very slowly. Thus, seed germination is prevented or reduced by the seed coat's impermeability to water. Seed coat impermeability to water declines with time and normally disappears completely within 6 months of harvest. Seed showing root emergence only may have had delayed germination because of partial inhibition of water uptake by impermeable seed coats. Both hard seed and delayed germination would reduce emergence potential of winter peas in the field compared to the emergence potential of seedlings from normally germinating seed.

The percentage of dead seed was generally low with one seed lot having 8 percent dead seed. Incidence of seedborne Ascochyta was less than 1 percent.

Large variations in seed quality exist among seed lots of Austrian winter peas produced in northern Idaho. As new varieties are developed, particularly semidwarfs with spring parentage, additional variability in seed quality, especially hard seed content, can be expected. These data indicate that all Austrian winter pea seedlots should be tested for hard seed and delayed germination.

Seed Quality of New Semidwarf Varieties

'Glacier,' a new semidwarf Austrian winter pea, had 14 to 25 percent hard seed when germinated immediately after harvest, depending on production environment. Hard seed content declined to less than 8 percent by 7 weeks after harvest and should not be a problem for growers. Hard seed percentage ranged from 0 to 60 percent in other semidwarf lines tested and could be a problem if hard seed were to persist for long periods after harvest.

New, winter edible peas without the pigmented seed coat were extremely susceptible to seed and seedling decay unless the seed was treated with Captan or other suitable seed treatment. These lines are being developed to allow fall planting of Alaska and Latah type peas. Seed treatment of these semidwarfs will be essential for good stands. Seed treatment of 'Common,' 'Fenn,' 'Melrose' and 'Glacier' seed hasn't been necessary because the pigmented seed coat offers some protection against fungal decay of the seed.

Table 1. Variability of seed germination, hard seed and dead seed in 16 seed lots of Austrian winter peas collected from elevators in northern Idaho.[1]

Seed lot[2]	Normal germination	Root emergence only	Hard seed	Dead seed
	(%)	(%)	(%)	(%)
1	65	6	28	1
2	82	11	6	1
3	93	5	2	0
4	81	10	8	1
5	82	10	0	8
6	85	5	10	0
7	75	12	13	0
8	92	3	4	1
9	77	8	15	0
10	84	3	12	1
11	94	1	5	0
12	94	4	2	0
13	82	4	13	1
14	91	5	3	1
15	90	3	6	1
16	76	4	18	2
LSD (0.05)[3]	12.0	7.5	7.9	1.8

[1]Seed lots were collected after harvest in 1974, and germination tests were conducted in January 1975.

[2]Seed lots were 'Common' except number 4 which was 'Fenn.'

[3]Differences within columns that exceed or equal the LSD value are significantly different at the .05 level.

Seed Size

Large seed usually produces more vigorous seedlings than small seed. Vigorous seedlings obtained from large seed are particularly advantageous when Austrian winter peas are subjected to root rots and other stressful environments. This study was conducted to determine the influence of seed size on spring seedling vigor and yield of Austrian winter peas fall planted on three dates in the fall at Moscow and two dates at Grangeville.

Seed of Common, Fenn and Melrose were sieved through slotted screens to provide three size classes (Table 2). Seed of each size class were planted Sept. 2, Oct. 4 and 25 at Moscow and Sept. 14 and Oct. 5 at Grangeville in 1977. At Moscow in 1978, the seeds were planted on Sept. 19 and Oct. 10 and 26. Spring seedling vigor was estimated and given a score of 1 to 3 with a score of 1 showing the most new growth and 3 the least new growth. Seed yield was measured by harvesting individual plots with a small plot combine.

Seed yield of Austrian winter peas established in October at Grangeville and Moscow, Idaho, from large-size seed was significantly higher than seed yield of peas established from small-sized seed (Table 3). Seed size had no influence on seed yield of September-planted peas at either location. Better spring growth from Austrian winter peas established from large- and medium-sized seed in October at Grangeville apparently improved yield. Environmental conditions are more adverse to pea development in October, and the increased vigor associated with large- and medium-sized seed was expressed as increased yield. Under more favorable conditions of September establishment, Austrian winter pea yields were not improved by increased spring seedling vigor.

Table 2. Size and weights of Austrian winter pea seed used in studies.

Size	Seed	
	Diameter	Weight
	(inches)	(seed/ounce)
large	15/64	<189
medium	14/64	218 to 189
small	13/64	>218

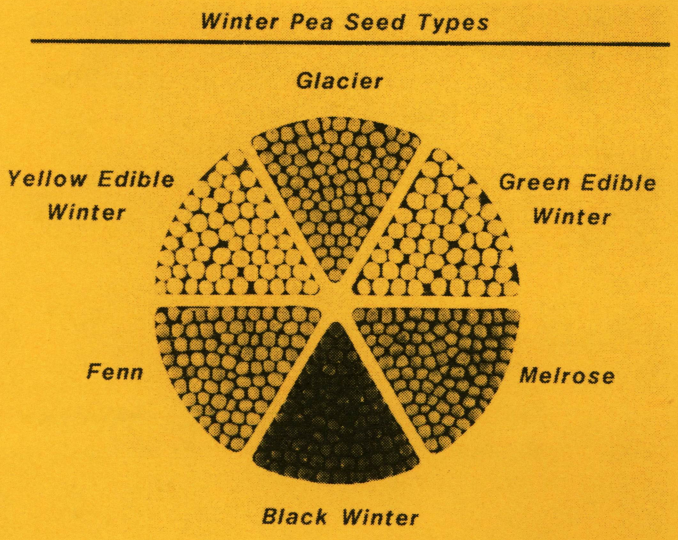

Fig. 1. New Austrian winter pea varieties will have different levels of hard seed, germination percentage and seedling disease resistance.

Table 3. The effect of seed size on seed yield of Austrian winter field pea seeded in September and early October at Grangeville in 1977 and Moscow in 1978.[1]

Seed size	Seed yield			
	Grangeville 1978-79		Moscow 1978-79	
	Sept.	Oct.	Sept.	Oct.
	(lb/acre)			
small	3,802	2,474	1,940	1,559
medium	3,688	2,889	1,834	1,762
large	3,712	3,136	1,768	1,867
LSD (0.05)[2]	NS	390	NS	158

[1]Means are averages of three cultivars.

[2]Means within a column are significantly different if differences between the means equal or exceed the LSD value.

Spring seedling growth of Melrose was better than seedling growth of Common and Fenn at both Moscow and Grangeville in 1977-78 (Table 4). Common had the lowest seedling vigor and a trend toward the lowest seed yields at both locations. When locations were combined, Melrose had significantly higher seed yields than Common. The number of seed per ounce was highest for Melrose growth at Moscow but lowest when grown at Grangeville (Table 4). No differences were observed in seed yields or plant populations of cultivars grown at Moscow.

Conclusions

These studies have shown that large variations in quality exist in current seedlots of Austrian winter peas. As new varieties of winter peas are developed and released, increased variability in quality factors such as hard seed and seed size can be expected. New, winter edible pea varieties without colored seed coats will likely be more susceptible to seed decay than current varieties of Austrian winter peas. Seed treatment will be essential for good stands of these varieties.

Seed size can influence yield, particularly when Austrian winter peas are seeded late or subjected to adverse environments. Large- and medium-sized seed should be used for planting under these conditions. A seed quality program should be developed for winter peas. Seed should be indexed for germination, hard seed, delayed germination and presence of seedborne disease such as Ascochyta and seedborne virus. A good seed program combined with both good agronomic practices and improved varieties should increase the potential productivity of winter peas.

Table 4. Performance of three AWFP cultivars grown at two locations in 1977-78

Cultivar	Moscow[1]			Grangeville[1]		
	Seedling vigor[2]	Seed yield	Seed weight	Seedling vigor[2]	Seed yield	Seed weight
	(score)	(lb/acre)	(seeds/oz)	(score)	(lb/acre)	(seeds/oz)
Fenn	1.8	6,581	273	1.7	3,239	260
Common	2.0	6,124	275	2.2	3,178	275
Melrose	1.6	6,485	258	1.5	3,429	281
LSD (0.05)	0.2	NS	5.7	0.3	NS	5.7

[1]Means are averages of two planting dates and three seed sizes.

[2]Means are averages of three planting dates and three seed sizes. New spring growth are estimated on a scale of 1 to 3 with 1 being the most and 3 the least spring growth.

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