Winterfat (*Krascheninnikovia lanata*) Seed Harvest Results From Four Different Methods

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Abstract

Winterfat (*Krascheninnikovia lanata* (Pursh) Guldenstaedt) is a semi-shrub with high palatability and nutritional quality. The shrub has potential to be a fall forage used to extend the grazing period. Presently seed supply is insufficient to meet demands. Therefore work is presently underway at SPARC to develop agronomic methodology to aid production of this shrub. Growing winterfat plants within a weed barrier fabric provided increased seed yield and growth. Seed harvest using vacuum and hand stripping resulted in the greater seed yields. Sickling of winterfat resulted in some stimulated growth.

Introduction

Winterfat (*Krascheninnikovia lanata* (Pursh) Guldenstaedt (syn. *Ceratoides lanata* (Pursh) JT Howell, syn. *Eurotia lanata* (Pursh) Meq.) has been identified as being a potentially valuable species for ecological restoration (Romo et al 1995), erosion control (Van Dersal 1938, Stubbendieck et al 1986) and winter forage for all livestock (Sampson 1924, USDA-FS 1937, Van Dersal 1938, Stubbendieck et al 1986). Protein and phosphorous content of winterfat is noted a s being sufficient for livestock on winter range (Smoliak and Bezeau 1967). Sampson (1924) had recommended reseeding native pasture to winterfat for winter feeding. Winter feeding adds substantial costs to livestock production.

Prior to increasing use of winterfat via seeding into pastures seed supplies must be obtained. Presently most seed originates in the US but a Canadian ecovar™ has recently gone out for seed increase so the possibility exists that Canadian seed will be available. The seed is presently obtained mainly from wild harvests by hand stripping. This method and the indeterminate characteristic of seed set add greatly to the cost. The seed is found within two bracts resulting a fruit very similar to a miniature cotton ball. The bracts are best not removed due to nutrients provided to seedling as well as anchoring role (Booth and Hafercamp 1995). This again adds to the difficulty of harvesting and seeding.

Work is presently underway at SPARC to examine methods to establish seed orchards and harvest seed. With development of these technologies seed costs should decline.

The objective this paper is to examine the impact of seed (fruit) harvest technologies on seed yield and plant growth.

Methods and Materials

Treatments were superimposed in a factorial complete randomized block design on plants that have established in a nursery at the Semiarid Prairie Agricultural Research Centre for the development of a winterfat ecovar^{TM}. The 40 plants were randomly located within a weed barrier and uncovered soil. The harvesting methods to be assessed include: (1) as a hand harvest control, the most common method presently used. (2) A simulation of combining (sickling) at 50% ripe seed stage of growth, a method used in New Mexico with larger shrubs than found here, will be the second method. (3) The third method will be a vacuum, to emulate equipment already available for insect harvesting. The vacuum method will take advantage of the natural ability of the seed to distribute itself with the wind. (4) The fourth and final treatment will use a flail-type seed stripper again at 50% seed ripe, a device which is commonly utilized for native seed harvest. There were 5 replicates. Crop presented includes seed harvest yields and plant height.

Results and Discussion

A) Soil covering

Plants grown within the weed barrier had greater seed yield and plant height when compared to plant growing in uncovered soil (Table 1). Weed competition was higher in uncovered soil. Also noted was a greater soil moisture conservation under the weed barrier (not reported here). These microclimate differences for plants within the weed barrier were contributing factors for increased seed yield and growth.

Table 1: Impact of Weed Barrier and Uncovered Soil on Seed Yield and Plant Height of Winterfat in 1997 and 1998.

	1997		1998	
	Weed Barrier	Uncovered Soil	Weed Barrier	Uncovered Soil
Seed Yield (gm per plant)	15.2	10.8	12.9*	3.5
CV(%)	33.3		45.6	
Plant Height (cm)	42.7	40.9	46.5	43.0
CV(%)	9.9		9.1	

* - Statistically significant (P>0.01). Statistical analysis performed on square root transformed data

while reported values are untransformed.

B) Harvesting method

Vacuum and hand stripping of plants yielded the greater amounts of seed for both years (Table 2). This was due in part to the possibility that the harvester could return to the plants to harvest seed which was not ripe previously. Returning to harvest seed not ripe previously was not an option with sickling or flail techniques. One was required to harvest when seed reached the desired ratio of ripe to green seed. For the purposes of this study 50% was chosen based on observations that as the plants passed 50% ripe loss of seed exceeded remaining ripe seed.

With sickling and flail greater portions of the plant not involved with inflorescence are removed. For sickling, portions above 10 cm was removed. With sickling there may be some stimulation to increase seed (Table 2) but not sufficient to exceed quantities obtained with vacuum and hand strip.

Seed harvest decreased the second year in part because of environmental conditions with a very wet spring followed by a exceedingly dry summer. While 1997 had a more evenly distributed precipitation pattern (data not reported).

Despite no differences for plant height as a result of harvest technique the sickle treatment does indicate some stimulated growth. Remembering anything above 10 cm was removed during the harvest procedure we note equivalent plant height the following year and possibly elevated seed production. On average 34 cm of growth occurred from 1997 to 1998. The flail method which also removes plant material appears to have a negative effect on plant height.(Table2)

Table 2: Effect of Harvest Method on Seed Yield and Plant Height of Winterfat in 1997 and 1998.

	Seed Yield (gm per plant)		Plant Height (cm)	
	1997	1998	1997	1998
Harvest method				
Vacuum	24.8	11.0	41.4	47.0
Hand strip	17.7	12.2	40.3	47.9
Flail	4.3	3.6	41.7	39.6
Sickle	2.9	6.9	43.9	44.4
CV(%)	33.3	45.6	9.9	9.1
Contrast				
Vacuum vs rest	s[a]	ns[b]	ns	ns
Hand vs Flail, Sickle	s	ns	ns	ns
Flail vs Sickle	s	ns	ns	ns

[a] - Statistically significant (P>0.05), [b] - Not Statistically significant (P>0.05). Statistical analysis performed on square root transformed data while reported values are untransformed.

Conclusion

Plants growing within a weed barrier were able to realize greater seed yields and plant growth than plants grown in uncovered soil. On this basis planting winterfat into a weed barrier should be considered if seed orchard is not overly large.

Methods of winterfat seed harvest can be ranked according seed harvest: vacuum>hand stripping>flail>sickle. Vacuum and hand stripping of seed should be considered preferred harvest methods especially when repeated harvests would be possible. Some growth stimulation is suggested when plants are cut during harvest process which would suggest some positive benefits for use as late fall forage. Similar responses have been noted in the literature as a response to late season grazing (Holmgren and Hutchings 1972).

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