TECHNICAL NOTES

Observations on the Mating System of Basin Wildrye

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Highlight
Basin wildrye appears to be an obligate cross pollinator. Under forced self-pollination seed set is less than 2%.

Before an effective plant breeding program can be initiated, certain basic information about the species to be improved is essential. In order to utilize genetic variation effectively and to select desirable genotypes efficiently, some knowledge of the mating system of the species is required. In addition, knowledge of the relative levels of self- and cross-pollination are of value in determining isolation requirements for the production of foundation and certified seed of improved crop varieties, in accordance with the regulations set forth by the Association of Official Seed Certifying Agencies.

Basin wildrye (Elymus cinereus) is a relatively unstudied species with significant potential as a native, perennial forage grass in the western United States. Currently, selection programs are in progress at Montana State University to increase yield and palatability in this species. In the summer 1968, levels of self- and cross-pollination were determined by scoring seed set on open pollinated heads, on single bagged heads, and on groups of heads from the same plant under a common bag. As the tip of the head emerged from the boot, it was placed in a glycite bag and the base of the bag was sealed without pinching the culm. The tillers with bagged heads were supported with twine loosely fastened to bamboo poles to allow normal culm elongation and to avoid wind damage to the culm and bag; however, bags were freely agitated by wind throughout the flowering period. Groups of from two to five heads from the same plant were treated in a similar manner. All observations were made on plants grown at Bozeman from a seed collection, Wy 107, obtained through the Soil Conservation Service Plant Materials Center, Bridge, Montana. Studies are currently in progress to determine the chromosome number and meiotic behavior in this population.

At maturity all bagged heads were harvested separately and a random collection of 100 heads from 87 plants was made. Seed set from single bagged heads reflects a minimum level of self-pollination. The difference in seed set between single bagged heads and groups of heads from the same plant in a common bag (Table 1) reflects possible difference in self-pollination due to differences in maturity of stamens and pistils within a head, or structural differences which inhibit self-pollination.

The difference between single bagged heads and groups of heads is non-significant. Mean seed set under open pollination is significantly greater than mean seed set under either method of forced self-pollination. Thus, it is apparent basin wildrye is not apomictic. This is further verified by the magnitude of within progeny variation for several quantitative traits (Kushnak and Chapman, in preparation). The cause of the low level of self-pollination cannot be determined with the present data. Based on the uniformly high seed set under open-pollination breeding stocks of basin wildrye will be treated as randomly mating and maximum isolation will be enforced.

<table>
<thead>
<tr>
<th>Sample type</th>
<th>Number of samples</th>
<th>Mean seed set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single bagged heads</td>
<td>66</td>
<td>1.08</td>
</tr>
<tr>
<td>Groups of heads</td>
<td>12</td>
<td>1.79</td>
</tr>
<tr>
<td>Random open pollinated heads</td>
<td>17</td>
<td>82.00</td>
</tr>
</tbody>
</table>

Table 1. Mean seed set per 100 florets and standard deviation of mean for three systems of mating in Basin wildrye.

Nitrogen Concentration of Grasses in Relation to Temperature

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Highlight
Six cool-season grasses and two warm-season grasses were grown in controlled environment chambers under cool- or warm-temperature regimes, fertilized with increasing rates of N, and analyzed for total N and nitrate content. The effect of warm or cool temperatures on percent N was different for warm- and cool-season grasses and varied among individual species. Only two species accumulated nitrate in the cool-temperature regime. Nitrate accumulation under the warm-temperature regime occurred for most of the species, but only after an application of 100 lb N/acre.

Characteristically, nitrogen-deficient soils limit range production in the western United States. Results from nitrogen fertilization have been varied. Although a lack of increasing forage production after N applications often may be attributed to inadequate rainfall or some other limiting factor, recent studies have indicated that range species react differently to applied N. Thus, knowledge of how each species responds to N fertilization under different environmental conditions would prove valuable in determining the practicability of increasing forage production by N applications. Such knowledge would make it possible to select range species for reseeding that would respond to fertilization, help establish an optimum rate and time of N application, and avoid some losses from nitrate poisoning.

Wright and Davidson (1964) showed that the response to N fertilization of a given plant species is affected by factors in addition to moisture, including temperature, soil, light intensity, rate of N application, micronutrients,