Seed production and resource allocation in three cultivars of *Achnatherum hymenoides*, Nevada, USA

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Introduction Plant production is partially determined by resource allocation among various organs (Monsi & Murata, 1970), however, studies on dry matter partitioning among different plant organs are scarce in general (Marceli, 1996), and lacking in *Achnatherum hymenoides*. This study compared dry matter production and partitioning among three commercial cultivars (Paloma, Nezpar and Rimrock) of *A. hymenoides* and identified growth and developmental characteristics that could indicate potential seed production. In addition, the relationship between an organ weight as a percent of total aerial plant biomass was assessed.

Materials and methods All three cultivars were seeded at a rate of 3.9 kg pure live seeds/ha on 1m row spacings, under irrigation in central Nevada, USA. Eight plants of each cultivar were randomly selected on each of two internal rows and seeds were harvested every week as they ripened (12 July-12 Oct.). Sixteen plants of each cultivar were randomly selected for tiller and leaf length measurements, and harvested to ground level at the end of the 2003 growing season. Total standing crop was divided into blades, sheaths, stems, seeds and reproductive structures (glumes, rachis, etc.). All parts (except seeds) were oven dried at 70° C for 48 h and weighed. Seeds were dried at 35° C for 48 h so they could be used later in germination studies. Each category was then expressed as a percent of total aerial plant dry weight. The ratio between blade and sheath dry weights was also calculated. Seeds were individually separated from the lemma and palea. In addition to dry matter production, on each of two tillers per plant, total green leaf length, total (green + dead) leaf length, and tiller length were determined. Number of green, total (green + dead) and reproductive tillers was also obtained. One-way ANOVA was used in all analyses and significance was determined at $P < 0.05$. Seed production and biomass relationships were analysed with simple linear regression.

Results and discussion Paloma had the lowest blade production and the greatest production of stems, seeds and reproductive structures. Seed production was greater for Paloma (5 kg/ha) than Nezpar (1.9 kg/ha) and Rimrock (0.3 kg/ha). Dependent seed variables correlated best with Paloma (number of reproductive tillers $P<0.001$, $R^2=0.84$; leaf length $P=0.006$, $R^2=0.62$; total above ground biomass $P<0.001$,$R^2=0.80$). The relationship between weight of an organ (sink size) and the percentage of total aerial biomass assigned to this organ was significant for blades and seed weight in all three cultivars. This could indicate a correlation between size and resource needs of the sink. However, need of the sink for resources is probably not causally related to size, because it can also depend on age, potential growth rate, carbohydrate supply, presence of other sinks, and resistance of the transport pathway to the flow of assimilates (Marcelis, 1996; Minchin & Thorpe, 1996). These relationships were not significant for reproductive structures in any cultivar.

Conclusions Based on one year of observation, Paloma would be better choice for land managers if seed production is a priority, and Rimrock a better choice if leaf and stem biomass is important. Nezpar would be a good combination choice. A better understanding of dry matter partitioning in the aerial portion of the 3 commercially available cultivars of this grass species will provide managers with the information needed to select a variety based on its intended use.

References

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