GROWTH CYCLE, FERTILIZER, PLANTING RATE, AND GENOTYPE INFLUENCE BARLEY HAY OR FORAGE GROWTH IN THE SOUTHWEST[1]

A. D. Day, professor, and M. J. Ottman, Extension agronomist,
Department of Plant Sciences

Summary

Information is incomplete on the general growth and production of spring barley grown as a winter-annual as opposed to an annual plant. Experiments were conducted over a five-year period at the Yuma Valley Agricultural Center, Yuma, Arizona, to study the effects of growth cycle, nitrogen fertilizer, planting rate, and genotype on the length of time from planting to flowering, plant height, percent lodging, and hay yield of spring barley (Hordeum vulgare L.) in a semiarid environment. Spring barley produces more forage when grown as a winter-annual than when grown as an annual. When barley is grown for forage it should receive more nitrogen fertilizer and be planted at a higher seeding rate than when it is grown for grain production. Barley genotypes differ in their forage potential and should be carefully selected for adaptation to the specific environment when high hay production is the principal objective.

Background

Spring barley (Hordeum vulgare L.) is grown as an annual plant in its general area of adaptation; however, in the semiarid areas of the southwestern United States it may be grown as an annual or winter-annual. Spring barley grown as an annual is planted in the winter and grows in the spring. Spring barley grown as a winter-annual is planted in the fall and grows in the late fall and spring. Information is incomplete on the general growth and production of spring barley grown as a winter-annual as opposed to an annual plant. The objective of the research reported in this paper was to study the influence of growth cycle, nitrogen fertilizer, planting rate, and genotype on the growth and production of hay from spring barley grown under irrigation in a semiarid environment.

Materials and Methods

Experiments were conducted at the Yuma Valley Agricultural Center, Yuma, Arizona, for a five-year period (1976-1980), to study the influence of growth cycle, nitrogen fertilizer, planting rate, and genotype on the growth and hay production of spring barley. The experimental design was a Split-Split-Split-Split Plot with growth cycles as main-plots, nitrogen fertilizers as sub-plots, planting rates as sub-sub-plots, and genotypes as sub-sub-sub-plots. The individual plot size was 36 ft^2 and each treatment was replicated four times. There were two growth cycles: annual and winter annual, two nitrogen (N) fertilizer treatments: 160 and 200 lb/acre, two planting rates: 80 and 100 lb/acre, and two genotypes: Arimar and AZ-1970-1. Barley grown as an annual was planted in February and barley grown as a winter-annual was planted in November. For each fertilizer treatment, 50% was applied at planting time and 50% was applied at the jointing stage of plant growth. All plots were irrigated throughout the growing season to ensure that the plants were never stressed for soil moisture. Hay was harvested at the flowering stage of plant growth with a sickle mower.

The following data were obtained from each plot each year, for a five-year period: (1) number of days from planting to flowering, (2) plant height, (3) percent lodging, and (4) air-dry hay yield. All data were analyzed using the standard analysis of variance and treatment means were compared using the Student-Newman-Keuls' Test.

Effects of Growth Cycle

When barley genotypes were grown as winter-annuals they required a longer period from planting to flowering, produced taller plants, were more susceptible to lodging, and produced higher hay yields than did the same genotypes when grown as annuals. Growing a spring barley as a winter-annual for forage production in a semiarid environment permits more effective use of irrigation water during the winter months when the irrigation demand from other crops is at a minimum.

Effects of Nitrogen Fertilizer

Barley fertilized with 200 lb/acre of nitrogen (N) fertilizer required more days from planting to flowering, had a higher incidence of lodging, and produced more hay than did barley fertilized with 160 lb/acre of nitrogen. These data indicate that when barley is grown for forage it is essential to use high rates of nitrogen fertilizer for maximum production. Although barley lodged more with the high fertilizer rate than it did with the low rate, it was possible to harvest both hay crops with normal forage harvesting equipment.

Effects of Planting Rate

Planting barley at 100 lb/acre of seed resulted in more lodging but higher hay yields than did planting the crop at 80 lb/acre. These barley genotypes can accommodate higher seeding rates when grown for forage than when utilized for grain production, since lodged plants can be recovered by a forage harvester. Planting rate had no significant effect on number of days from planting to flowering or plant height.

Effects of Genotype

Arimar barley required more days from planting to flowering, produced taller plants, had more lodging, and produced more hay than did AZ-1970-1. Since both barleys were spring types with similar environmental adaptation, these experiments indicate that it is possible to select specific genotypes of spring barley that may be more desirable for forage production than other genotypes with similar general adaptation.

Influence of growth cycle, nitrogen fertilizer, planting rate, and genotype on the growth and hay yield of spring barley grown at the Yuma Valley Agricultural Center, Yuma, Arizona (5-year average).

	Planting to flowering	Plant height	Lodging	Air hay
	(day)	(inch)	(%)	(lb/
<u>Growth Cycle</u>				
Annual	93	31	6	
Winter-annual	126	41	77	
	**	*	**	
<u>Nitrogen (lb/acre)</u>				
160	105	34	34	
200	114	38	48	
	*	NS	*	
<u>Planting rate (lb/acre)</u>				
80	108	37	38	
100	111	35	45	
	NS	NS	*	
<u>Genotype</u>				
AZ-1970-1	105	33	36	
Arimar	114	39	47	
	*	*	*	

NS, *, ** Not significant at the 5% level and significant at the 5% and 1% levels, respectively.