BARLEY...

Dates & Rates of Planting

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Dates and rates of planting are important because of their effects on the growth and development of all agricultural plants. Knowledge of the optimum date and rate of seeding specific crops is essential for maximum production of high quality plant products. Most spring barley grown under irrigation in the United States is planted in March or April and is harvested in July or August. In Arizona, barley is planted in November or December and harvested in May or June of the following year. Since dates and rates of planting spring barley in the southwestern United States differ from those normally used for this crop, these studies were undertaken to determine optimum dates and rates of planting spring barley grown under irrigation in Arizona.

Materials and Methods

In 1961 and 1962, Harlan barley was seeded on four dates (September, October, November, December) and at three rates (35, 60, 100 lb./acre). From 1962 through 1965, Arivat barley was seeded on three dates (November, December, January) and at six rates (10, 20, 40, 60, 80, 110 lb./acre). Similar cultural practices were followed for both varieties (cultivars). Plantings were made in a moist seedbed. The experimental designs were split-plots with dates as main plots and rates as sub-plots with four replications. Plot size was 6 ft. wide and 25 ft. long. Yield data were obtained from 24 sq. ft. Number of days from planting to maturity (Maturity = 14% moisture in grain), plant height at maturity (plant height = distance from ground level to tip of spike, excluding awns), and lodging at maturity (percentage of plants broken or bent 45° or more) were recorded. Sub-samples of 4 sq. ft. were taken from each plot and yield component determinations (heads per unit area, seeds per head, seed weight) were made. All data were analyzed using the standard analysis of variance and means were compared using Duncan's multiple range test. These experiments were conducted on the Mesa Experiment Station.

November and December Plantings Best for Harlan

September and October planting

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Table 1

Average grain yield, volume weight, number of heads in four square feet, number of seeds per head, and weight of 1,000 seeds from the Harlan Barley Date of Planting and Rate of Planting Experiments grown at Mesa, Arizona in 1961 and 1962.

Planting date	*Planting rate (lb/acre)*	*Grain yield (lb/acre)*	*Volume weight (lb/bu)*	*Number of heads in 4 sq. ft.*	*Number of seeds per head*	*Seed weight (g/1,000)*
September	35	3130 abcd*	47.5 ab	168 bc	41 a	41.9 def
	60	2711 d	46.8 ab	158 bc	36 ab	42.5 cde
	100	2748 cd	47.8 ab	163 bc	34 ab	41.2 fg
October	35	2966 bcd	47.1 ab	192 ab	30 b	45.3 a
	60	3239 abcd	47.1 ab	195 ab	31 b	43.7 b
	100	3112 abcd	45.9 b	215 a	30 b	42.3 cde
November	35	3367 abcd	48.4 ab	139 c	36 ab	43.2 bc
	60	3603 ab	48.5 a	168 bc	35 ab	42.7 bcd
	100	3385 abcd	48.1 ab	174 bc	36 ab	41.6 ef
December	35	3676 ab	46.6 ab	152 c	36 ab	42.3 cde
	60	3749 a	46.8 ab	139 c	34 ab	40.7 g
	100	3476 abc	46.5 ab	160 bc	34 ab	41.0 fg
C.V. (%)		10.36	3.43	11.02	12.61	5.18

** Means followed by the same letter are not different at the 5% level of significance.*

dates for Harlan barley were too early for maximum grain production (Table 1). The relatively low yields from the September and October plantings were attributed to a high incidence of yellow dwarf and severe lodging. In the November and December plantings, the 35-, 60-, and 100-lb per acre rates of seeding produced similar grain yields.

Similar Grain Volume Weights for Harlan

With two exceptions, grain volume weights were essentially the same for all planting dates and rates (Table 1). The October planting date produced more heads per unit area and fewer seeds per head than other dates. Seed weight was generally lower for the higher seeding rates for all planting dates. The September planting date required the greatest number of days from planting to maturity, followed by the October, November, and December dates, in decreasing order. Each delay in planting date resulted in shorter plants and less lodging.

November Plantings Best for Arivat

Arivat barley plants produced highest grain yields from the November planting date, except for the 110-lb. planting rate (Table 2). The lower grain yield from the high seeding rate was due to more lodging and fewer seeds per head. In general, each delay in planting date, for any given planting rate, resulted in a lower yield. For both December and January planting dates the higher planting rates produced highest yields, because of more heads per unit area. Grain volume weights were highest from the November planting date. Increased seeding rates for the November planting date resulted in decreased grain volume weights. However, increased seeding rates for the December and January planting dates produced higher volume weights. With the exception of the 110-lb seeding rate in January, for each planting date, each increased seeding rate resulted in more heads per unit area. High rates of seeding resulted in fewer seeds per head for all dates of planting. The November planting date produced barley with higher seed weight than the December date, for all planting rates.

In general, as the planting date was delayed and the planting rate was increased, the number of days to maturity decreased. Likewise, each delay in planting date resulted in shorter plants for any given planting rate. Low planting rates resulted in taller plants in November plantings and shorter plants in January plantings. Each increase in planting rate for each planting date increased lodging, with the most lodging in the higher seeding rates of the November plantings.

Increase Seeding Rate for Late Plantings

As the date of seeding is delayed beyond the optimum for grain production, the rate of seeding should be increased regardless of how the crop is to be used. This is because later-planted grain has a shorter vegetative period in which to tiller and develop roots. Varieties differ in growth and maturity. Thus, the planting date and rate should be adjusted to the variety that is to be grown. Lodging is one of the most serious problems in small grain production in Arizona. The severity of this problem is conditioned by management practices and environment.

Early Planting Saves Water

Usually, when barley is planted in November, rather than October, one irrigation is eliminated because the first post-planting irrigation can be delayed until early March with a minimum of tillering retardation. In years of little or no winter rains irrigation in February may be necessary. On the other hand, if planting is delayed until January, one additional

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Table 2

Average grain yield, volume weight, number of heads in four square feet, number of seeds per head, and weight of 1,000 seeds from the Arivat Barley Date of Planting and Rate of Planting Experiments grown at Mesa, Arizona from 1962 through 1965.

Planting date	*Planting rate (lb/acre)*	*Grain yield (lb/acre)*	*Volume weight (lb/bu)*	*Number of heads in 4 sq. ft.*	*Number of seeds per head*	*Seed weight (g/1,000)*
November	10	4630 a*	47.6 a	112 efg	41 a	42.3 a
	20	4540 a	47.3 bc	119 ef	39 abc	40.7 cd
	40	4449 a	47.4 b	122 de	35 de	40.8 c
	60	4358 ab	47.3 bc	137 bc	36 bcd	40.7 cd
	80	4403 ab	47.3 bc	153 a	31 fg	41.4 b
	110	3995 cd	46.9 d	157 a	28 gh	42.1 a
December	10	3132 hi	44.9 l	96 h	36 bcd	40.5 de
	20	3450 fg	45.7 j	105 gh	35 de	38.1 i
	40	3677 de	45.6 j	108 fg	36 bcd	38.8 h
	60	3813 de	46.0 h	121 de	32 ef	40.2 ef
	80	3904 cde	46.6 f	147 ab	29 gh	40.2 ef
	110	4131 bc	46.7 e	151 a	27 hi	40.2 ef
January	10	2451 j	44.6 m	68 j	37 bcd	39.4 g
	20	2814 i	45.2 k	94 hi	40 ab	40.6 cd
	40	3268 gh	45.9 i	111 efg	35 de	41.4 b
	60	3405 fg	46.2 g	118 ef	30 fgh	40.5 de
	80	3632 ef	46.6 f	135 bc	29 gh	41.4 b
	110	3450 fg	46.6 f	133 cd	25 i	40.5 de
C.V. (%)		6.17	0.91	8.33	8.74	1.94

**Means followed by the same letter are not different at the 5% level of significance.*

Spider Mite

treated check and the Morestan treatment in figure 1 require some explanation. All three stages — egg, immature forms, and adults — in the check were slightly lower than at the time of the pretreatment level while stages in the Morestan treatment showed considerable increase. A predaceous mite (species undetermined) was found to occur commonly in the pretreatment samples. A likely explanation is that this predator effected a certain amount of control over the population in the untreated check while it was eliminated from the Morestan-treated plants, permitting an increase of the spider mite which was apparently unaffected by the acaricide.

Alfalfa Test. Results of the alfalfa experiment, in general, agree with those obtained in cotton. However, control was somewhat poorer in the alfalfa treatments than identical treatments in the cotton, particularly when comparing the treatment effects on egg and immature stages. These data are presented in table 2 and in figure 2.

Four of the acaricides which were categorized as good in the cotton test achieved a similar ranking in the alfalfa test. The acaricide G.S. 19851 was ranked as good on cotton but fell to the intermediate ranking in the alfalfa because of poorer control of immature and adult stages and an actual increase in the egg counts. The greatest difference any material exhibited between the two tests involved ethion which moved from the ranking of poor in the cotton test to that of good in the alfalfa test, primarily because of a good reduction of the adult population. The poor showing of ethion against the adult mite in the cotton test was responsible for its placement in the poor category.

The untreated check and the Morestan treatment were placed in the poor category in both tests. Two treatments — tetradifon and disulfoton — achieved intermediate rankings in both tests while the remaining two treatments—dimethoate and U-27415 — were ranked as intermediate on cotton and poor on alfalfa.

In summary, four treatments — Azodrin, Acaralate, Cholrobenzilate, and Galecron — gave the most satisfactory spider mite control in these tests. Other treatments exhibited less efficacy against the strawberry spider mite.

Table 2. Influence of several acaricides on populations of the strawberry spider mite, *Tetranychus* (*Tetranychus*) *turkestani, on alfalfa*. Parker, Arizona . 1969.

Treatment	*Rate lbs./A.*	*Pre-treatment infestation*[1] *Egg*	*Immature*	*Adult*	*Per cent decrease (or increase) mean post-treatment infestations*[2] *Egg*	*Immature*	*Adult*
Check	**—**	**66**	**5**	**19**	**(+78.5)**	**(+202.5)**	**7.1**
Morestan	**0.20**	**28**	**10**	**7**	**(+359.2)**	**(+47.4)**	**(+65.8)**
dimethoate	**0.25**	**23**	**4**	**15**	**(+66.4)**	**(+107.0)**	**50.8**
U-27415	**0.75**	**65**	**11**	**23**	**(+14.9)**	**(+2.1)**	**65.5**
disulfoton	**0.50**	**59**	**14**	**25**	**(+15.7)**	**46.1**	**64.9**
G.S. 19851	**0.50**	**30**	**10**	**12**	**(+11.1)**	**57.0**	**64.5**
tetradifon	**1.00**[3]	**60**	**33**	**15**	**(+88.7)**	**92.8**	**79.1**
ethion	**1.00**	**86**	**30**	**21**	**62.3**	**87.0**	**84.**[illegible]
Chlorobenzilate	**1.00**	**44**	**11**	**16**	**57.8**	**91.4**	**84.8**
Acaralate	**1.00**	**59**	**16**	**17**	**65.5**	**78.3**	**87.9**
Galecron	**0.50**	**64**	**19**	**20**	**60.6**	**94.1**	**94.3**
Azodrin	**0.50**	**56**	**5**	**18**	**58.4**	**71.8**	**97.7**

[1] *Mean of 5 triofaliates per sample.*
[2] *Means of 3, 7, and 14-day post-treatment counts.*
[3] *Tetradifon was inadventently applied at a heavier rate than 1.0 lb./acre.*

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irrigation may be required during grain formation because the crop matures during a period of higher temperatures.

Low Rates and Early Dates Are Best

Minimum rates of planting are suited to November and December dates of planting because cooler temperatures and usual winter moisture are conducive to a prolonged vegetative period and maximum tillering. Present barley planting rates could be decreased without decreasing grain yields. Growers in Arizona should plant high quality seed at lower rates to increase yield potential and grain quality by reducing lodging.

Varieties Differ

Barley yields are influenced by many variables. For maximum returns, seeding dates and rates must be adjusted to the specific variety planted and to the conditions under which the crop is grown.

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