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Dairy Guidelines
COOPERATIVE EXTENSION SERVICE, V.P.I., BLACKSBURG, VIRGINIA

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Barley for Silage in Virginia

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Winter barley is an adapted and reliable crop in all areas of Virginia. It also is a versatile crop in that it can be used for fall and spring grazing, for silage, or for grain production. The use of barley for silage is becoming increasingly popular in Virginia with dairy and beef cattle farmers. If harvested at the proper stage, silage provides a means of utilizing the leaves and stems of the plant, along with a considerable portion of the grain, in a nutritious and palatable form.

In growing barley for silage, the same production practices should be followed as when growing the crop for grain production. These practices basically are as follows:

Soil Adaptation: Barley does best on soils that are well drained, that have a pH between 6.0 and 7.0, and that are in a moderate to high state of fertility. Very poor performance can be expected from poor soils and from soils with a pH below 5.6.

Fertilization: The amount of fertilizer applied will depend on the state of fertility of the soil. A soil analysis is helpful in determining the proper amount. The amounts needed usually will range from 30 to 80 lbs. N, 0 to 60 lbs. P_2O_5 and 0 to 60 lbs. K_2O. Up to 50 lbs. of the nitrogen may be applied as top-dressing in February or early March. On heavy clay soils most of the nitrogen can be applied at planting; on sandy soils it is advisable to split the nitrogen between fall and spring applications.

The barley silage crop may be fertilized slightly higher than the grain crop since the silage will be harvested before lodging becomes a major problem.

Time of Planting: Barley should be planted approximately 2 weeks prior to the average date of the first frost in the fall. This generally falls between September 15 and October 1 West of the Blue Ridge; September 25 and October 10 in the Piedmont; and October 10 and November 1 in the Coastal Plains. The earlier the crop is planted within these periods, usually the better the performance will be.

ISSUED IN FURTHERANCE OF COOPERATIVE EXTENSION WORK, ACTS OF MAY 8 AND JUNE 30, 1914, IN COOPERATION WITH THE U. S. DEPARTMENT OF AGRICULTURE. W. E. SKELTON, DIRECTOR OF EXTENSION SERVICE, VIRGINIA POLYTECHNIC INSTITUTE, BLACKSBURG, VIRGINIA 24061.

Rate of Planting: Plant from 6 to 8 pecks (72 to 96 lbs.) per acre.

Recommended Varieties: The following varieties are recommended for the indicated regions of the state: (*Bearded varieties; other varieties are awnleted.)

West of Blue Ridge and Northern Piedmont	Southern Piedmont and Coastal Plains
Dayton*	Dayton*
Harrison*	Colonial 2
Pennrad	James
Wong	Wade*
	Wong

Among the recommended varieties, Harrison and Pennrad are the most winter hardy and should be used in areas where winter-killing is a problem.

Stage of Harvest for Silage: Barley may be harvested for silage at any stage of growth from the bloom to soft dough. Stage of harvest is important in determining whether the crop will need wilting prior to ensiling, the yield to be expected, and the quality of the silage. The decision regarding stage of harvest will be influenced by a number of factors, including the objectives of the individual farmer. The following data, obtained from an experiment conducted at Charlotte Court House, Virginia, in 1964 and 1965, are presented regarding the effect of stage of maturity on yield and composition of barley silage:

Table 1. Agronomic Characteristics of Barley Harvested at Various Stages of Maturity

Stage of Harvest*	Dry Matter		Plant Parts (%)			Crude Fiber (%)	Protein (%)	T.D.N.	
	(%)	Lbs/A.	Leaves	Stems	Heads			(%)	Lbs/A.
Bloom	22	4876	23	60	17	32	10.4	65	3578
Milk	36	6184	17	51	32	31	9.7	53	3659
Soft Dough	47	6484	12	43	45	28	10.7	61	4494

*The following are descriptions of the crop at the various stages of harvest:
Bloom - When the heads are just beginning to emerge from the "boot" or flag-leaf sheath.
Milk - When the endosperm is forming, but is still in a liquid or watery state. (Usually a week to 10 days after bloom.)
Soft Dough - When the endosperm has solidified, but still can be dented easily by the thumbnail. (Usually 2 to 3 weeks after bloom.)

YIELD AND QUALITY

The following observations are made regarding the quantity and quality of dry matter production at the bloom, milk, and soft dough stages of maturity:

Bloom - Yield of forage is lowest and quality of the forage is highest at this stage. Yield per acre is approximately 25% less, and yield of total digestible nutrients (TDN) is approximately 20% less than at the dough stage. Moisture content of the forage is approximately 80%, so it would be necessary to cut and wilt prior to ensiling.

Milk - Yield per acre of forage is intermediate between the bloom and soft dough stages, and quality of the forage is lower than at the bloom or dough. This lower quality results from the fact that quality of the leaves and stems has declined and the heads have not filled sufficiently to compensate for this decline in quality. Moisture content of the forage is around 60% and is borderline between needing and not needing to wilt.

Soft Dough - Yield per acre is maximum at this stage and quality is only slightly inferior to the bloom stage. This improvement in quality from the milk stage results from the fact that the equivalent of 40 to 80 bushels of grain has been added to the leaves and stems. Even though quality of the leaves and stems has declined, the addition of the grain brings the quality back up to a very acceptable level. Moisture content generally is low enough to permit ensiling directly without wilting.

If the barley crop should lodge severely as a result of excess fertility or a storm, the crop should be harvested as soon as convenient, regardless of stage of growth. Yield and quality usually decrease rapidly under conditions of severe lodging.

Expected Yields: The per acre yield of barley silage will be related to stage of growth at harvest, the fertility level of the soil, and climatic conditions prevailing during the particular crop year. Based on average performance of a large number of varieties grown at Steeles Tavern over a 3-year period from 1965 through 1967, and harvested at the dough stage, dry matter yield was approximately 7200 lbs. per acre. Based on a moisture content of 55% at ensiling time, this would be equivalent to a silage yield of approximately 8 tons per acre. Grain yield from the same varieties for the same period was approximately 66 bushels per acre. Management practices giving higher or lower grain yields should influence silage yields accordingly.

Double Cropping: The harvesting of barley for silage is favorable for double cropping with summer annuals, such as sudangrass, millet, grain sorghum, soybeans, and early maturing corn varieties in the Coastal Plains and southern Piedmont. The silage crop usually can be harvested 2 to 3 weeks earlier than the barley grain crop. This permits the summer annual to be planted earlier and usually results in better performance.

BARLEY SILAGE FOR LACTATING COWS

Experimental Results

In the spring of 1966, barley harvested at the Blacksburg Station, for silage at bloom, milk and hard-dough stages was fed to lactating cows for comparative performance. Bloom silage was wilted, while milk and hard dough were direct cut. Dry matter content for the respective silages averaged 33.8, 26.4 and 37.8%. Treatment consisted of silage offered *ad libitum* as the only forage and concentrate fed at the rate of 1 lb. per 3 lb. of milk produced during standardization. Silage dry matter intakes were approximately equal for the milk and hard-dough stages, both considerable greater than bloom

stage. Milk yields, fat, SNF, and protein were not affected by silage maturity throughout the trial (Table 2). Bodyweight gains were significantly higher on milk and dough silage.

Table 2. Effect of Barley Silages Harvested at Various Stages of Maturity on Intake, Milk Production, Composition and Bodyweight.

Item Evaluated	Stages at Which Silage was Harvested		
	Bloom	Milk	Hard Dough
Intake (lb/100# bdwt)(dry basis)	1.24	1.54	1.43
Intake (lb/100# bdwt)(35.0% D.M.)	3.54	4.40	4.37
Milk (lb/day)	58.9	58.3	59.2
Milk fat (%)	3.36	3.25	3.33
Milk SNF	8.80	8.85	8.73
Bdwt gains (lb/day)	0.02	0.86	0.90

Soft Dough Stage Best

It should be pointed out that when silage is harvested in the hard-dough, considerable field-losses can be expected from plant shattering. Furthermore, V.P.I. studies show that considerable hard-dough grain passed through the digestive tract undigested. Because of this, dry matter and non-fiberous carbohydrates were less well digested in the hard dough silage than in the bloom and milk stages. Studies with ensiled soft-dough barley during 1967 showed that the whole plant including the grain was well-digested. Therefore, it is recommended that barley be ensiled if possible during the soft-dough stage for the following reasons:

1) Yield of crude protein and TDN per acre are at a maximum.

2) The major nutrient components are highly digestible.

3) Good silage can be made by direct-cut and ensiled without wilting (38-47% D.M.).

Other Nutritional Considerations

Soft-dough barley, as observed in Table 1, contains about 45% heads. With such a high grain content, it ranks comparable to good corn silage according to the V.P.I. net energy index and its analyzed crude protein content. In a study at V.P.I. during 1967, a 14% crude protein concentrate supported milk production as well as an 18% concentrate when fed at the rate of 1 lb. concentrate per 3 lbs. of milk. However, to assure adequate protein intake, it is recommended that the concentrate contain 16-18% crude protein.

Urea may be added to soft-dough barley silage at the rate of 10 lbs. per ton of field-chopped material. If this alternative is chosen, the crude protein content of the concentrate need not exceed 14% and should not contain urea.