The Effect of Stand and Moisture Content on Computed Yields of Alfalfa

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In making critical comparisons between varieties of alfalfa, a number of factors have been recognized and their effects considered. Tysdal and Kiesselbach (2) and Weihing and Robertson (4, 5) considered such factors as number of rows per plot, distance between rows, alley space between plots, removal of border rows at harvest, and interplot varietal competition. As a result of their studies, types of plots which give satisfactory yield comparisons are well established.

Tysdal and Kiesselbach (2) have suggested that, within reasonable limits, there may be considerable latitude in the amount of seed sown without significantly affecting comparative varietal performance. In their studies, stands from rows seeded with different amounts of seed tended to equalize after 4 years. There is little or no information regarding the effect of stands and intraplot competition on yields in the first year after seeding. This paper reports the effects of stands on yields in the 2 years following the year of seeding.

Weihing (3), in studying differences in percentage dry matter at harvest, concluded that in order to obtain strictly comparable yields, the percentage dry matter for each harvested plot should be determined. Wilkins and Hyland (6) on the other hand concluded that yield determinations based on green weights were satisfactory. Since all yields reported here were calculated on the basis of percentage dry matter determined for each harvested plot, it seems worthwhile to present the conclusions drawn from these determinations over a 2-year period.

Materials and Methods

In April 1946, 30 of the varieties and strains of alfalfa in the regional uniform testing program were established in five-row plots, 30 feet long with rows in the plot spaced 7 inches apart. Distance between rows in adjacent plots was 18 inches. Seed was drilled at the rate of 2.5 grams per row (9.8 lbs./acre). The 30 varieties were divided into three groups of 10 each and the groups were arranged in a latin square with three replications and the 10 varieties were randomly arranged in each group. A fourth replication of these three groups, and four replications of an additional group were established but since the arrangement in the field of these additional plots is such that varieties and groups are completely confounded, the results are not included here. An additional 30 varieties on which seed was limited also were established in a latin square with three groups of 10 in single-row plots, 16.5 feet long and 1 foot apart, drilled at the rate of 1.46 grams per row (8.5 lbs./acre). Plots were clipped high once in 1946 to control weed growth.

Three cuttings were obtained both in 1947 and 1948 when most varieties appeared to be in the 1/10 to 1/4 bloom stage. Approximately 500 gram moisture samples were obtained from each plot immediately after cutting, weighed, and reduced to constant weight in a forced air drier operating at about 160°F. Through an error, moisture samples from the first cutting of the single-row plots were discarded before completely dry and a constant percentage dry matter was assumed in calculating yields. Yields are reported as tons of forage at 12% moisture and in the case of the five-row plots include the area occupied by the 18-inch alleys. Plot ends were trimmed before each harvest.

Stand determinations were made in the fall of 1947 and in the spring and fall of 1948 by a method suggested by R. R. Mulvey, professor of agronomy at Purdue. Each row was considered to consist of 6-inch units. Thus a five-row plot, 30 feet long, contained 300 such units. The number of blank 6-inch units was determined for each plot and is expressed as the percentage of the total. Blank spaces less than 6 inches long were not counted and blank spaces more than 6 inches long were recorded as the number of 6-inch units in the blank space, i.e., number of feet × 2.

Experimental Results

The Relation of Yield and Stand

Pertinent data from the analyses of variance on stand and yield data for the first 2 years are presented in Table 1. It is apparent that conditions for yield were favorable in both seasons. Significant differences in yield among varieties within groups are indicated for both years for the test with five-row plots but not for the test with single-row plots. Lack of significance in the single-row-plot test is undoubtedly partially explained by the greater variability as shown by the higher coefficients of variability. Stands in general were fairly satisfactory. Mean stands for varieties ranged from 76% to 94% in 1947 and from 73% to 95% in 1948 for the five-row plots and from 81% to 95% in 1947 and from 82% to 98% in 1948 for the single-row plots with means as shown in Table 1. The method of stand determination as used gave slightly higher values in 1948 which are attributed to an increase in the diameters of crowns without a decrease in number of plants which would tend, in some cases, to reduce the length of the blank space in the row. Significant differences in stand were noted only in the five-row-plot test in 1948, although the coefficients of variability were low and similar in both types of tests.

Since the alfalfa uniformity tests contain both single crosses and polycrosses in addition to synthetic and standard varieties, it may be desirable to obtain true measures of yielding ability freed from possible stand difference effects irrespective of whether these effects

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Note: Figures in parenthesis refer to "Literature Cited", p. 473.

4Associate and junior assistant, respectively, in agronomy. 
5Contributed from the Department of Agronomy, Purdue University, Lafayette, Ind. Journal Paper No. 392, Purdue University Agricultural Experiment Station. Received for publication April 6, 1949.