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Tests With Corn and Sorghum

Outlying Testing Report 6

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CONCLUSIONS AND RECOMMENDATIONS

Farmers in the Columbia Basin can grow field corn profitably by following a few recommended practices. These are based on the information gained from the 1955 trials reported here and on past experiments.

CORN

*Where the growing season is long enough, plant Wisconsin 641AA or its equivalent in maturity type (115 days). It should be planted the first week in May. For areas with shorter growing seasons or for later planting (after May 7) use Wisconsin 416AA or its equivalent. For planting after June 1, a short-season variety such as Wisconsin 240 should be used.

*The amount of nitrogen to apply for corn depends upon the crop and fertilizer history of the field to be planted. In planning the fertilizer program, a good starting point is 160 pounds of nitrogen per acre. Use less than this amount if your corn crop follows alfalfa or a leguminous green manure crop. Use this amount or more on new land, particularly if the corn follows dry-land wheat. Yield and cost figures show that it is good insurance to apply more rather than less than the estimated need and that a good return can be expected from the investment in nitrogen.

SORGHUM

*Sorghum can be grown in the Basin with reasonable success, but there are a few disadvantages which farmers should consider. The moisture content must be quite low (12 per cent for safe storage as compared to 25 per cent for ear corn.)

*Sorghum must be harvested earlier than corn because of susceptibility to lodging and to sparrow damage.

*Select one of the following varieties: Double Dwarf White Sooner, Double Dwarf Yellow Sooner, or Early Hegari.

OUTYLING TESTING IN WASHINGTON

The Outlying Testing Program was initiated in 1953 by the State College of Washington. This program is carried out by the Experiment Stations and Extension Service in

cooperation with local farmers. The work in Eastern Washington is being carried on in Franklin, Adams, and Grant counties of the Columbia Basin. Trials have been conducted on field corn, dry beans, grain sorghum, wheat, and barley.

In 1955, 13 trials were conducted on bean fertility, corn fertility, corn varieties, and sorghum varieties. These experiments were scattered throughout the Basin as shown in Table 6. The different locations represent differences in soils, elevation, and climate. Of particular importance are the differences in temperature and in the length of frost-free period.

L.S.D. - A TERM YOU'LL WANT TO KNOW

When conducting an experiment, scientists make every effort to keep all conditions the same, except the treatments (such as rates of nitrogen). Nevertheless varying conditions such as soil and plant differences always enter the experiment by chance. Differences in yield, therefore, may be due to chance alone or they may be due to treatment.

By means of statistics the scientist can estimate the amount of chance variation. Then he can tell whether or not variation is greater than the amount he would expect to be due to chance.

For example, in Table 3, "L.S.D." (least significant difference) value has been calculated for each trial. Each figure within a column is the average value from four plots receiving the same treatment. If the difference between any two values within a trial (column) is larger than the L.S.D. appearing at the bottom of the column, the difference can be considered "significant" or real, and not due to chance variation. Remember that it is possible for differences which approach the L.S.D. value to be due to treatment, although in a strict sense the difference would not be considered significant.

CORN VARIETY TRIALS

Six corn varieties, representing a wide range of maturity types, were planted at three locations -- in Block 15 near Eltopia, in Block 41 near Moses Lake, and in Block 73 near Winchester. The cooperator, location, and soil type for each trial are listed in Table 6. In each case the land has been farmed under irrigation before 1955. Fertility was not considered a limiting factor except at Eltopia, where nitrogen-deficiency symptoms appeared by mid-season. The corn was planted at the rate of 17,500 plants per acre, which is equivalent to a 9-inch spacing with 38 inches between rows. The varieties were planted in small plots and each variety was tested four times within a trial. The moisture content of the grain was determined on October 19 and again at harvest time.

The varieties, the approximate days to maturity for each, and the average yield and moisture content at each location are presented in Table 1. As the table shows, there were significant differences in moisture content among varieties for each sampling date at every location.

There were significant differences in yield among varieties at Moses Lake and at Winchester. The yields at Eltopia were low and variable; this reduces the value of the data. The low yields were due to a poor stand and to nitrogen deficiency which appeared in spite of a 180-pound per acre application of nitrogen. Nitrogen may have been leached by irrigation water from the light soil of the experimental area. In addition, the decomposing, heavy crop of disced-under corn stover from the 1954 crop may have competed for nitrogen with the 1955 crop.

The moisture data from the trial at Eltopia is of interest because it shows the wide differences among maturity groups. Under the conditions of the trial a variety maturing in 100 days or less probably should be planted. However, previous experiments have demonstrated the varieties equivalent to Wisconsin 641AA can give excellent results in the Pasco area when planted about May 1 and when adequately fertilized.

At Moses Lake, Iowa 939 yielded more than any other variety, but not significantly more than Wisconsin 641AA, which requires about the same time to mature.

At Winchester, best results were obtained with Wisconsin 641AA. The yield was higher than that of all others, but not significantly higher than Iowa 939. The moisture content was at a very desirable level for cribbing.

The variety of corn to plant depends primarily upon (1) the planting date and (2) the length of growing season in the area. For most of the Basin, Wisconsin 641AA or a similar maturity type (115 days) is satisfactory if planted early (before May 7) and properly fertilized and cared for. In areas with shorter growing seasons or for later planting (after May 7), Wisconsin 416AA or its equivalent can be used. For planting after June 1 a short season variety such as Wisconsin 240 should be used.

CORN FERTILITY TRIALS

Corn fertility trials were conducted in three locations. Information regarding each location is shown in Table 2. As shown in the table, each of the trial areas had been cropped under irrigation prior to 1955.

Nitrogen was the only fertilizer studied. The plots were side-dressed soon after the corn came up. Each of the treatments was

Table 1. Yield and Moisture Content of Six Corn Varieties at Three Locations.

Variety	Approx. days to maturity	Block 15, Eltopia Planted May 17 % Moisture Oct. 19	Block 15, Eltopia Planted May 17 % Moisture Nov. 3	Block 15, Eltopia Planted May 17 Yield at 15.5% moisture bu./acre	Block 41, Moses Lake Planted May 11 % Moisture Oct. 19	Block 41, Moses Lake Planted May 11 % Moisture Nov. 9	Block 41, Moses Lake Planted May 11 Yield at 15.5% moisture bu/acre	Block 73, Winchester Planted May 5 % Moisture Oct. 19	Block 73, Winchester Planted May 5 % Moisture Nov. 3	Block 73, Winchester Planted May 5 Yield at 15.5% moisture bu./acre
Wis. 240	80	21.1	20.5	63.0	25.0	20.7	107.0	17.9	16.4	112.0
Wis. 416AA	95	32.5	26.8	48.1	32.4	26.6	118.2	20.1	17.4	125.0
Wis. 464A	100	32.0	28.1	55.6	32.1	25.9	140.9	20.7	18.9	132.1
Wis. 641AA	115	36.8	29.1	58.5	35.0	27.3	141.9	23.4	19.6	156.9
Iowa 939	115	35.1	28.8	48.1	38.7	29.7	164.6	25.4	21.7	147.1
U.S. 13	120	39.2	32.4	59.4	42.2	32.9	139.8	28.9	24.7	142.6
L.S.D.*		3.9	2.5	N.S.†	2.7	5.2	38.8	6.0	2.3	15.3

*L.S.D. (Least significant difference) refers to the amount necessary between any two values within a column before the difference can be considered real and not due to chance variations.

†Not significant. All yield differences in this trial could have occurred by chance.

repeated four times within a trial. Ammonium nitrate was used as the source of nitrogen. Nine nitrogen rates were used, ranging from 0 to 400 pounds per acre of available nitrogen.

The yields of corn as they were influenced by the various rates of nitrogen are presented in Table 3. At Eltopia the trial was in the same field as that of the Block 15 variety trial (See Corn Variety Trials page 2) where the low yields were obtained. The highest yield in the fertility trial was obtained at the 400-pound rate and the yields do not appear to have reached a maximum at this point. At Moses Lake, the maximum yield appears to have been at the 160-pound rate and at Winchester at the 80-pound rate.

The value of the corn harvested as related to the nitrogen rate is shown in Table 4. In most cases the return for the investment in fertilizer is rather high. An outstanding feature of the table is that it demonstrates that it usually is safe to fertilize on the high side of the recommended rate. For example, at Moses Lake the maximum yield appeared to have been reached at about the 160-pound rate (Table 3). Table 4 indicates, however, that the grower would be more likely to lose by dropping to the 80- or 120-pound rates than by going up to applications of 200 pounds or more. Much the same is true of the trial at Winchester where, although the maximum yield is probably reached at the 80-pound rate, it might be good insurance to use more than this amount. At Eltopia the highest return was at the 400-pound rate of nitrogen. In this case, a substantial amount of nitrogen may have been leached out by irrigation water.

A large number of corn fertility experiments in Central Washington have demonstrated that the most economical rate of nitrogen for field corn on new land is 160 to 200 pounds per acre. The 1955 Outlying Testing trials indicate how that condition can vary on land which has been under irrigation one or more years. In general, it is advisable not to reduce the 160-pound recommended rate unless there is reason to believe there is a high level of nitrogen in the soil. Less than this amount may be used if the corn follows alfalfa or a leguminous green manure crop.

SORGHUM VARIETY TRIALS

Nine varieties of sorghum were planted at two locations. One trial was planted in Block 16 near Eltopia on April 26 and the other in Block 74 near Quincy on May 5. The cooperator, location, and soil type for each may be found in Table 6.

Both trials were on newly irrigated land. Because of poor stand in both trials and wind damage at Eltopia, yields were quite low. Variations among plot yields were sufficient to reduce considerably the reliability of the yield

Table 2. Information Regarding the Locations of the Three Corn Fertility Trials

Location	Block No	Variety of Corn	Soil Type	1954 Crop	1954 fertilizers (lbs. per acre)
Eltopia	15	Wis. 641AA	Royal loamy fine sand	Corn	N-180
Moses Lake	42	Wis. 416AA	Timmerman sandy loam	Beans	N - 80 P_2O_5 - 40
Winchester	73	Wis. 416AA	Babcock silt loam, shallow phase	Beans	N-120

Table 3. Yield of Corn as Influenced by Rates of Nitrogen Applied (bushels per acre at 15.5% moisture)

Nitrogen applied (pounds per acre)	Block 15, Eltopia	Block 42, Moses Lake	Block 73, Winchester
0	23.6	30.2	81.6
40	25.9	74.8	106.7
80	39.4	108.6	121.9
120	48.5	109.4	111.5
160	41.3	129.0	130.3
200	57.8	131.4	118.5
240	78.7	139.9	117.1
320	80.9	128.0	129.1
400	110.9	138.8	120.4
L.S.D.*	26.5	26.4	17.8

*L.S.D. (Least significant difference) refers to the amount necessary between any two yields within a trial before the difference can be considered real and not due to chance variation.

Table 4. The Cost of Nitrogen Fertilizer and the Value of Extra Corn Harvested

Nitrogen lbs. /acre	Cost of fertilizer per acre*	Value of additional Corn per acre (over the check) minus the cost of fertilizer+		
		Eltopia	Moses Lake	Winchester
0	--	--	--	--
40	$ 5.60	$ 2.15	$ 61.30	$32.05
80	11.20	12.50	106.40	49.25
120	16.80	20.55	102.00	28.05
160	22.40	4.15	125.80	50.65
200	28.00	23.50	123.80	27.35
240	33.60	49.05	130.95	19.65
320	44.80	41.15	101.90	27.05
400	56.00	74.95	106.90	2.20

*Nitrogen is figured at 14¢ per pound. The cost of application is not included.

+Corn is figured at $1.50 per bushel dry (15.5 per cent moisture) and shelled. Cost of harvesting per acre is usually constant regardless of yield. Hauling and drying costs are highly variable and are not included in these figures.

figures. Results are shown in Table 5.

Three recommended varieties, Double Dwarf White Sooner, Double Dwarf Yellow Sooner, and Early Hegari appeared to do as well or better than any of the others tested. Although Midland and Coes produced well at Quincy, they did not do well at Eltopia. One of the three recommended varieties should be used until more information is available on new varieties.

Differences in per cent moisture in either trial were not significant. The moisture levels in the Block 74 trial were surprisingly low - well under the 12 per cent level considered safe for storage.

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Table 5. Yield and Moisture Content of Nine Sorghum Varieties at Two Locations

Variety	Block 16, Eltopia		Block 74, Quincy	
	% Moisture (at harvest, Oct. 27)	Yield bu. per acre 15.5% moisture	% Moisture (at harvest, Nov. 1)	Yield bu. per acre actual moisture
Double Dwarf White Sooner	16.7	57.2	8.2	71.7
Double Dwarf Yellow Sooner	17.4	61.4	7.8	62.3
Double Dwarf Early Hegari	17.1	45.1	8.5	58.9
Early Hegari	16.6	42.7	8.3	78.0
Midland	17.5	32.6	7.7	65.9
Coes	16.1	43.3	8.2	68.2
Reliance	17.1	23.9	7.9	50.8
Norghum	14.9	41.9	8.6	59.0
Ryer	18.1	38.4	7.7	45.2
L.S.D.*	N.S.†	11.9	N.S.†	N.S.†

*L.S.D. (Least significant difference) refers to the amount necessary between any two values within a column before the difference can be considered real and not due to chance variations.

† Not significant. All differences in this column could have occurred by chance.

Table 6. Locations of 1955 Columbia Basin Outlying Testing Trials

Farm Cooperator	Block No.	Location	County	Soil Type*	Type of trial
Ralph Kincaid	15	Eltopia	Franklin	Royal loamy fine sand (Othello)†	Bean fertility
Eldon Jenks	12	Mesa	Franklin	Eltopia fine sandy loam (Ephrata)	" "
Jay Jenkins	49	Othello	Adams	Ephrata silt loam (Ephrata)	" "
D. E. Nelson	44	Warden	Grant	Warden silt loam (Warden-Wheeler)	" "
Murphy Black	72	Quincy	Grant	Warden silt loam (Warden-Wheeler)	" "
Marshall & Lafferty	15	Eltopia	Franklin	Royal loamy fine sand (Othello)	Corn fertility
Alfred Woolman	42	Moses Lake	Grant	Timmerman sandy loam (Ephrata)	" "
Erwin Wiser	73	Winchester	Grant	Babcock silt loam, shallow phase (Ephrata)	" "
Marshall & Lafferty	15	Eltopia	Franklin	Royal loamy fine sand (Othello)	Corn variety
Bill Bellomy	41	Moses Lake	Grant	Ephrata gravelly very fine sandy loam (Ephrata)	" "
Ken Schroeder	73	Winchester	Grant	Haywood silt loam (Warden-Wheeler)	" "
Lawrence & Eldon Weber	74	Quincy	Grant	Renslow silt loam (Warden-Wheeler)	Sorghum variety
Ed Bobson	16	Eltopia	Franklin	Hezel loamy fine sand (Quincy)	" "

*Information obtained through courtesy of R. A. Gilkeson and the Dept. of Conservation and Survey, State College of Washington. The new series names will appear in a survey report now in press.

†Series names in parenthesis were used prior to 1955.

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