7-1961

The Influence of Nitrogen Sources and Time of Application on Dark Fire-Cured Tobacco

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Bulletin 329

July, 1961

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SUMMARY AND CONCLUSIONS

1. Nitrogen applications increased dark fire-cured tobacco yield and acre value, but had little effect on grade index.

2. No differences in tobacco yields from using the three nitrogen sources were observed when all the nitrogen was applied at planting. When considering an average for all times of nitrogen application, ammonium nitrate and sodium nitrate gave significantly higher yields than urea.

3. As the time of applying nitrogen is delayed after transplanting, and for conditions similar to those encountered here, it appears desirable to use a nitrogen source containing at least 50% of its total nitrogen in the nitrate form.

4. Ammonium nitrate and sodium nitrate sources of nitrogen gave significantly higher acre values of dark fire-cured tobacco than urea.

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INTRODUCTION

The nitrogen supply for the tobacco plant is one of the factors that determines the yield and quality of the tobacco produced. The information in this bulletin was obtained from experiments conducted at the Highland Rim Experiment Station to determine the effects of three sources of nitrogen and three times of application upon the yield, grade index, and acre value of dark fire-cured tobacco.

EXPERIMENTAL PROCEDURES

The broadleaf Madole variety was used in these experiments. The experiments were located on a Dickson silt loam in 1958, a Sango silt loam in 1959, and a Bewleyville silt loam in 1960. The transplanting dates were June 9 in 1958, May 25 in 1959, and June 3 in 1960. The harvest dates were September 12 in 1958, August 25 in 1959, and August 31 in 1960. After curing and stripping, the tobacco was graded by a Federal tobacco grader.

The three nitrogen materials used were UREA, which represents an ammonium source of nitrogen, AMMONIUM NITRATE, which represents a source containing half ammonium and half nitrate sources of nitrogen, and SODIUM NITRATE, which represents a nitrate source of nitrogen. Each nitrogen material was ap-

plied at the rate of 120 pounds of nitrogen per acre (267 pounds of urea, 358 pounds of ammonium nitrate, and 750 pounds of sodium nitrate per acre). A treatment receiving no nitrogen was also included to evaluate the response to applied nitrogen. Phosphate and potash were applied in accordance with soil test and all plots received 0-92-192 in 1958, 0-138-240 in 1959, and 0-138-288 per acre in 1960. All fertilizers applied before transplanting were broadcast.

Results and Discussion

Pounds per acre yield

The dark tobacco yields in pounds per acre are shown in Table 1. A highly significant response to nitrogen was obtained each year. No significant difference in average yields was observed among the nitrogen sources during any 1 of the 3 years. However, for the 3-year average, the ammonium nitrate and sodium nitrate sources produced significantly higher yields than urea, averaging about 70 pounds more per acre per year.

In only 1 of the 3 years was a significant difference between the times of application observed. For the 3-year average, significantly higher yields were obtained when all the nitrogen was applied at planting or half at planting and half as a sidedressing than when all the nitrogen was applied as a sidedressing.

In examining the results from the individual treatments, it is apparent that when all the nitrogen is applied just before transplanting, no differences among the nitrogen sources were obtained. When all of the nitrogen was applied as a sidedressing, yields were lower; also, using an ammonium source as a sidedressing material produced significantly lower yields than when the sidedressing nitrogen source was half ammonium and half nitrate, or all nitrate.

Grade index

Grade index is used here to refer to the average price per 100 pounds of tobacco based upon the average price received by farmers for the various Federal Grades over the 5-year period from 1952 through 1956.

Nitrogen sources and times of application caused a significant difference in grade index in only 1 of the 3 years. As a 3-year average, none of the three nitrogen sources or the three times of application had a significant effect on grade index. The application of nitrogen significantly influenced the average price per 100 pounds (Grade Index) received for the tobacco in only 1 of the 3 years; and for the 3-year average, there was no significant difference.

Dollar acre value

The dollar acre value of the tobacco is based upon the yield per acre and the average prices received by farmers for the various Federal Grades during the years 1952 through 1956. Applying 120 pounds of nitrogen per acre greatly increased the acre value of the tobacco (3-year average) above that of the no-nitrogen treatment. A significant difference in the acre value among the sources of nitrogen was observed in only 1 of the 3 years. However, the average acre value for the 3 years was significantly higher when ammonium nitrate and sodium nitrate were used than when urea was the nitrogen source. This is largely a reflection of the pounds per acre yield, as nitrogen sources had little or no influence on grade index.

The 3-year average indicates that applying all the nitrogen at planting or half at planting and half as a sidedressing resulted in essentially the same acre value. However, applying all the nitrogen as a sidedressing resulted in a significantly lower acre value.

In the 3-year averages for the individual treatments, a gradual decline in the acre value was observed for urea and ammonium nitrate as the time of application after transplanting was delayed. The acre value with sodium nitrate was the highest when half of the nitrogen was applied at planting and half was applied as a sidedressing. However, the lowest acre value with all three sources occurred when all the nitrogen was applied as a sidedressing.

Table 1—Pounds per acre yield of dark tobacco as influenced by three nitrogen sources applied at three different stages of growth.

Tmt. No.	Source	Method of application	1958	1959	1960	3-year av.
1	No nitrogen	. . . .	1465	2039	1866	1790
2	Urea	All at planting	1882	2345	2222	2150
3	"	½ plant., ½ sidedr.	1806	2183	2134	2041
4	"	All sidedressing	1730	2284	2127	2047
5	Am. Nit.	All at planting	1956	2300	2217	2158
6	" "	½ plant., ½ sidedr.	1941	2315	2183	2146
7	" "	All sidedressing	1796	2193	2274	2088
8	Sod. Nit.	All at planting	1927	2413	2108	2149
9	" "	½ plant., ½ sidedr.	2030	2267	2252	2183
10	" "	All sidedressing	1896	2233	2133	2087
L.S.D. (5%)			230	86	N.S.	116
(1%)			315	119	N.S.	154
SOURCES						
Urea			1806	2209	2161	2059
Ammonium nitrate			1898	2269	2225	2131
Sodium nitrate			1951	2305	2158	2138
L.S.D. (5%)			N.S.	N.S.	N.S.	67
(1%)			N.S.	N.S.	N.S.	N.S.
TIME OF APPLICATION						
All at planting			1921	2352	2182	2152
½ planting; ½ sidedressing			1926	2255	2190	2124
All as sidedressing			1808	2175	2171	2051
L.S.D. (5%)			N.S.	86	N.S.	67
(1%)			N.S.	119	N.S.	N.S.
N Vs. NO N						
No nitrogen			1465	2039	1866	1790
Nitrogen			1885**	2260**	2181**	2109**

**Differences significant at the 1% level of probability.

Table 2—Grade index of dark tobacco as influenced by three nitrogen sources applied at three different stages of growth.

Tmt. No.	Source	Method of application	1958	1959	1960	3-year av.
1	No nitrogen	. . . .	36.58	45.10	46.14	42.61
2	Urea	All at planting	40.96	42.58	46.52	43.35
3	"	½ plant., ½ sidedr.	40.13	44.16	48.46	44.25
4	"	All sidedressing	39.36	42.89	45.51	42.59
5	Am. Nit.	All at planting	42.22	44.49	48.54	45.08
6	" "	½ plant., ½ sidedr.	40.96	43.71	50.08	44.92
7	" "	All sidedressing	41.59	42.89	46.79	43.76
8	Sod. Nit.	All at planting	41.66	41.13	47.43	43.41
9	" "	½ plant., ½ sidedr.	42.46	41.65	47.40	43.84
10	" "	All sidedressing	42.88	44.36	44.30	43.85
L.S.D. (5%)			2.69	N.S.	N.S.	N.S.
(1%)			3.69	N.S.	N.S.	N.S.
	SOURCES					
Urea			40.15	43.21	46.83	43.40
Ammonium nitrate			41.59	43.70	48.47	44.59
Sodium nitrate			42.33	42.38	46.38	43.70
L.S.D. (5%)			1.55	N.S.	N.S.	N.S.
(1%)			N.S.	N.S.	N.S.	N.S.
	TIME OF APPLICATION					
All at planting			41.61	42.73	47.50	43.95
½ planting; ½ sidedressing			41.18	43.17	48.65	44.33
All as sidedressing			41.28	43.38	45.53	43.40
L.S.D. (5%)			N.S.	N.S.	2.23	N.S.
(1%)			N.S.	N.S.	N.S.	N.S.
	N Vs. NO N					
No nitrogen			36.58	45.10	46.14	42.61
Nitrogen			41.36**	43.09	47.23	43.89

**Difference significant at the 1% level of probability.

Table 3—Dollar acre value of dark tobacco as influenced by three nitrogen sources applied at three different stages of growth.

Tmt. No.	Source	Method of application	1958	1959	1960	3-year av.
1	No nitrogen	. . . .	537	919	860	772
2	Urea	All at planting	771	998	1032	934
3	"	½ plant., ½ sidedr.	725	963	1037	908
4	"	All sidedressing	684	899	968	850
5	Am. Nit.	All at planting	826	1019	1076	974
6	" "	½ plant., ½ sidedr.	795	1013	1092	967
7	" "	All sidedressing	746	939	1066	917
8	Sod. Nit.	All at planting	804	991	1000	932
9	" "	½ plant., ½ sidedr.	862	944	1068	958
10	" "	All sidedressing	813	991	937	914
L.S.D.	(5%)		115	N.S.	N.S.	65
	(1%)		157	N.S.	N.S.	87
	SOURCES					
Urea			726	953	1012	897
Ammonium nitrate			789	990	1078	952
Sodium nitrate			827	975	1002	935
L.S.D.	(5%)		67	N.S.	N.S.	38
	(1%)		N.S.	N.S.	N.S.	N.S.
	TIME OF APPLICATION					
All at planting			801	1003	1036	947
½ planting; ½ sidedressing			794	973	1066	944
All as sidedressing			748	943	990	894
L.S.D.	(5%)		N.S.	N.S.	N.S.	38
	(1%)		N.S.	N.S.	N.S.	50
	N Vs. NO N					
No nitrogen			537	919	860	772
Nitrogen			781**	973	1031**	928**

**Differences significant at the 1% level of probability.