UNIVERSITY OF KENTUCKY :: COLLEGE OF AGRICULTURE :: AGRICULTURAL EXPERIMENT STATION :: LEXINGTON

Compiled by J.H. Smiley • Progress Report 195

Kentucky Farm Tobacco Research Report

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KENTUCKY FARM TOBACCO RESEARCH REPORT

INTRODUCTION

J. H. Smiley

This progress report is the result of a cooperative effort between the U.K. College of Agriculture extension and research staffs and certain industrial companies, county extension agents, and producers.

The objective of most of these studies was to extend applied research in all phases of tobacco production by obtaining data from a wider range of soil types and climatic, disease, and management conditions than is possible at the Agricultural Experiment Station and Substations. Because of the limited number of personnel engaged in applied research in tobacco, more information can be obtained through farm tests than through any other means.

Farm tests serve to bring research more closely to the people where they can observe the results first hand. Farmers are more likely to follow practices they see demonstrated in their own areas and under conditions similar to their own. These tests also are a means of keeping county extension agents and agri-business personnel, as well as farmers, aware of what is being done in research. County extension agents can also do a better job when they have information from studies made in their area. These tests tend to bridge the gap between research and extension personnel, and working more directly with farmers makes the researcher more aware of the farmers' problems.

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RELATIVE PERFORMANCE OF HYBRIDS AND STANDARD VARIETIES OF BURLEY TOBACCO

Paul D. Legg and Glenn B. Collins

Significant yield increases have been obtained in several cross-pollinated crops through the commercial use of hybrids. Because of this success with certain crops, various groups are now encouraging the use of hybrids in many other crops, including tobacco. To receive commercial consideration, hybrids should exceed the performance of their parents and other varieties by an amount sufficient to cover the added costs associated with the production of a hybrid crop.

A 2-year test with 66 hybrids and 12 varieties was conducted at Lexington to obtain information on the relative performance of F_1 hybrids and standard varieties of burley tobacco. The average performance of all varieties and hybrids is given in Table 1. On the average, hybrids were approximately 2 days earlier and yielded 118 lb more cured leaf per acre. However, a comparison of individual hybrids with a high parent in the cross or with Ky 10, the highest yielding variety in the test (Table 2), shows that most commercially available hybrids yielded less cured leaf than Ky 10 and their highest yielding parent. These data indicate that a hybrid should be chosen only if it has desirable characteristics other than yield that are important. One of these characteristics would be disease resistance. Certainly with black shank in the soil, serious consideration should be given to L-8 hybrids and hybrids involving such varieties as Burley 37 and Burley 11A.

Table 1.--Mean Performance of Parental Varieties and F_1 Hybrids

	Days to Flower	No. of Leaves	Plant Height, centimeters	Yield, lb/A
Varieties	62.00	20.90	137.28	2,480
Hybrids	59.90	21.10	140.99	2,598
% heterosis	-3.44**	1.10	2.70	4.77**

**Significantly different from zero at 0.01 level.

Table 2.--Relative Yield (pounds per acre) of Hybrids from Certain Individual Tobacco Crosses

Cross	Yield of F_1	Yield of First Parent	Yield of Second Parent	Yield of F_1 Relative to Average Parent	Yield of F_1 Relative to High Parent	Yield of F_1 Relative to Ky 10
		(Yield, lb/A)				
Burley 37 x Ky 10	3,040	2,218	3,124	369	-84	-84
Burley 37 x Ky 12	2,790	2,218	2,791	286	-01	-334
Burley 21 x Ky 10	2,955	2,995	3,124	-104	-169	-169
Burley 21 x Ky 16	2,531	2,995	2,394	-134	-464	-593
Burley 21 x Ky 12	2,964	2,995	2,791	71	-31	-160
Ky 10 x Ky 12	2,924	3,124	2,791	-34	-200	-200
Ky 10 x Burley 11A	2,800	3,124	2,004	236	-324	-324
Ky 16 x Burley 11A	2,440	2,394	2,004	241	46	-684
Ky 12 x Burley 11A	3,009	2,791	2,004	612	218	-115
Ky 12 x Ky 16	2,880	2,791	2,394	288	89	-244

GENETIC CONTROL OF ALKALOIDS (NICOTINE) IN BURLEY TOBACCO

P. D. Legg and G. B. Collins

Interest in tobacco varieties with lowered alkaloid (nicotine) levels has been generated because a number of tobacco and health research studies indicate that nicotine might be involved in the health problems associated with tobacco. A rather intensive research effort on development of a burley tobacco line with low total alkaloid content has resulted in the breeding line LA Burley 21. LA Burley 21 has an alkaloid level which is roughly one-twentieth that found in our commercial varieties.

LA Burley has been extremely valuable as a research material for inclusion in various tobacco and health studies. These studies involve determining the role of nicotine in health problems. Although LA Burley 21 is of commercial acceptability, it does yield approximately 500 lb per acre less than Burley 21. Also, the extremely low level of alkaloids is probably too low for direct use by the industry.

Research efforts during the past two years have resulted in the development of two true breeding lines with intermediate levels of alkaloids. These intermediate lines are characterized by alkaloid levels between the LA Burley 21 parent and the high parent level typical of commercial varieties. The level of total alkaloids in the high, low, and intermediate lines is presented in Table 1.

Table 1.—Percent Total Alkaloids in Burley Tobacco Lines

Line	% Alkaloids
LA Burley 21	0.25-.30
Intermediate 1	2.00
Intermediate 2	3.30
Burley 21	3.80

Current research includes further development of the agronomic characteristics of the lines with intermediate alkaloid levels plus the development and evaluation of blends obtained by mixing different proportions of seed from the high, low, and two intermediate lines. We hope to develop individual blends representing alkaloid levels of 1.0, 1.5, 2.0, 2.5, and 3 %. Also, the four homozygous lines (LA Burley 21, Burley 21, and the two intermediates) are being evaluated in the statewide variety tests in 1971.

BLACK SHANK CONTROL THROUGH VARIETAL DEVELOPMENT AND EVALUATION

G. B. Collins, P. D. Legg, C. C. Litton, and J. H. Smiley

Control of the fungal disease known as black shank, or more technically as Phytophthora parasitica var. Nicotianae, is a major disease effort in our research program. A number of research studies have been underway for a number of years. Results include the development of the black shank breeding line known as L8. L8 is not commercially acceptable because of a severe leaf spotting irregularity in some way associated with the genetic character for black shank resistance transferred from a wild tobacco relative. However, L8 is usable as a parent in producing F_1 hybrids that are resistant to the common race of black shank.

Currently we are developing several experimental lines carrying black shank resistance. This work involves making crosses and screening the plants for resistance to black shank under black shank infested field conditions and by using inoculation with the disease organism in the greenhouse. We are also studying the genetics or inheritance of black shank resistance and making a concerted effort to eliminate the leaf spotting anomaly from L8. The program for varietal development is slow, but we anticipate reasonably rapid progress now towards the ultimate release of one or more black shank resistant varieties.

A vital part of our program is to evaluate each year the available varieties and hybrids with resistance to black shank. These evaluations provide the basis for farmer selection of the best variety to grow in his individual situation. The black shank testing program in 1969 and 1970 was located in Cumberland County on soil infested with the black shank organism. Eight burley tobacco varieties were grown, with each entry being grown in 1/50-acre plots replicated four times.

The hybrids of L8 are known to be resistant to race 0, the most common race of the black shank organism, but have little or no resistance to race 1. Varieties of Burley 37 and Burley 49 are moderately resistant to both races of the black shank organism. Race 1 apparently was not present in the soil used for this study in sufficient amount to affect plant growth.

Good yields were obtained with the black shank resistant varieties, while the yield of Ky. 14 was extremely low, indicating a heavy infestation of the organism in the soil, Table 1. All hybrids and black shank resistant varieties had a mortality rate of 1.5% or less at harvest time; Ky. 14, a non-resistant variety, had a mortality rate of 72%.

Table 1.—Yield of black shank resistant burley tobacco varieties and hybrids and Ky. 14 tested on black shank infested soil, 1969 and 1970, Cumberland County, Ky.

	Yield (lb per acre)		
Variety	1969	1970	Average
MS B 21 x L8	3,124	2,842	2,983
MS B 37 x L8	3,100	2,779	2,940
MS B Ky. 12 x L8	3,092	2,673	2,882
Va 509	2,470	2,816	2,643
B 37	2,537	2,608	2,572
B 11A	2,507	2,570	2,538
B 49	2,478	2,469	2,474
Ky. 14	893	746	820

FERTILIZER PLACEMENT STUDIES ON BURLEY TOBACCO

J. H. Smiley and A. M. Wallace

Ammonium nitrate applied broadcast was plowed under and disked in at three rates on burley tobacco soils at two locations in Kentucky in 1969 and at three locations in 1970. In 1969 disking in resulted in slightly, but not significantly, higher yields when 150 lb N per acre was applied; plowing under resulted in higher yields when 350 lb N was applied, and there were no differences in average yields for the two practices when 250 lb N was applied. Average yields for all N rates did not differ significantly for the two practices, and the general trend was for yields to increase as N fertilizer increased. In 1970 plowing under resulted in slightly, but not significantly, higher yields for all N rates. Yields increased as N rates increased. For the 2-year average, there were no differences in yields for the two practices for the 150 lb and 250 lb N rates, but when 350 lb of N was applied, plowing under resulted in a slightly, but not significantly, higher yield. Average yields increased as N rates increased (Table 1). These tests indicate that when high rates of nitrogen are used it might be advisable to plow it down.

Table 1.—Effect of Fertilizer Nitrogen Placement on Yield of Burley Tobacco, lb/A

		1969			1970				Two-year
		Mercer	Morgan	Average	Mercer	Morgan	Rowan	Average	Average
Plowed Under	150	3,482	2,625	3,052	3,754	4,242	2,373	3,456	3,254
	250	3,554	3,206	3,380	3,627	4,663	2,664	3,651	3,516
	350	3,894	3,318	3,606	3,857	4,692	2,664	3,738	3,672
	Average	3,643	3,050	3,346	3,746	4,532	2,567	3,615	3,481
Disked In	150	3,455	2,919	3,187	3,514	4,198	2,501	3,404	3,296
	250	3,709	3,066	3,388	3,709	4,304	2,684	3,566	3,477
	350	3,630	3,225	3,428	4,070	4,336	2,583	3,663	3,546
	Average	3,598	3,070	3,334	3,764	4,279	2,589	3,544	3,439
Average	150	3,468	2,772	3,120	3,634	4,220	2,437	3,430	3,275
	250	3,632	3,136	3,384	3,668	4,484	2,674	3,609	3,496
	350	3,762	3,272	3,517	3,964	4,514	2,624	3,701	3,609

SOURCES OF NITROGEN FOR BURLEY TOBACCO

J. H. Smiley, A. M. Wallace, J. L. Sims, and W. O. Atkinson

The form of nitrogen added in fertilizers to burley tobacco may have a significant effect on the growth, yield, and quality of cured leaf. Additionally, the form used may determine in large part the efficiency of a given application of nitrogen. Research has shown that ammonium forms, in contrast to nitrate, generally have the advantage of being retained by the soil and are subject to less loss. However, ammonium forms acidify the soil more, result in slower growth, and may be toxic to young tobacco plants when present in large amounts. Acid soils have higher concentrations of manganese and aluminum that may be toxic to plants at certain stages of growth. Whereas, considerable research has been conducted on sources of nitrogen for tobacco when applied at low or medium rates, little information exists that compares sources or forms at high rates of application. The present study was conducted to compare sources of nitrogen fertilizer when applied at near recommended and high levels.

An experiment was conducted during 1970 at each of three locations. Treatments consisted of two rates of nitrogen (200 and 400 lb N/acre), three sources of nitrogen (urea, ammonium nitrate, and potassium nitrate), and two times of application (all pre-transplant and 1/2 pre-transplant-1/2 post-transplant). At both times of application, fertilizer was broadcast on the plowed or cultivated soil surfaces and worked into the soil. Sufficient amounts of phosphorus and potassium had been uniformly applied to all plots prior to transplanting and mixed with the soil. Variety Ky 14 was utilized at all locations.

Results

Although the results are for one year only, certain trends appear to have developed. Applying N at rates of 400 lb N/acre produced slightly higher leaf yields but slightly lower values per cwt than applying rates of 200 lb N. Thus, dollars per acre were nearly equal for both N fertilizer rates. Applying N in split applications of one-half at transplanting and one-half sidedress resulted in slightly higher average values per cwt and per acre but slightly lower leaf yields than did single applications prior to transplanting.

Source of N influenced both yield and value of cured leaf, with highest values resulting from use of KNO_3 and lowest from urea. The magnitude of average differences among sources, however, was small in test tests. Additional research is needed to define more adequately the influence of source of N on burley tobacco.

Table 1.—1970 Nitrogen Rate and Source Test. Yield, lb/A.

N Rate, lb/A	Time of Application	Location (County)	Nitrogen Source KNO_3	UREA	NH_4NO_3	Average
200	All Preplant	Franklin	3,546	3,584	3,538	3,556
		Muhlenberg	3,834	3,132	3,495	3,487
		Whitley	3,154	2,899	3,126	3,060
		Average	3,511	3,205	3,386	3,367
	½ Preplant ½ Postplant	Franklin	3,734	3,681	3,673	3,696
		Muhlenberg	3,860	3,551	3,568	3,660
		Whitley	3,016	3,054	2,986	3,019
		Average	3,537	3,429	3,409	3,458
		Franklin	3,640	3,632	3,606	3,626
		Muhlenberg	3,847	3,342	3,532	3,574
		Whitley	3,085	2,976	3,056	3,039
		Average	3,524	3,317	3,398	3,413
400	All Preplant	Franklin	3,498	3,498	3,719	3,572
		Muhlenberg	4,286	3,976	3,512	3,925
		Whitley	3,010	2,874	3,470	3,118
		Average	3,598	3,449	3,567	3,538
	½ Preplant ½ Postplant	Franklin	3,867	3,548	3,750	3,722
		Muhlenberg	3,409	3,628	3,814	3,617
		Whitley	2,766	2,770	2,638	2,725
		Average	3,347	3,315	3,401	3,355
	Average	Franklin	3,682	3,523	3,734	3,647
		Muhlenberg	3,848	3,802	3,663	3,771
		Whitley	2,888	2,822	3,054	2,921
		Average	3,473	3,382	3,484	3,446
Average	All Preplant	Franklin	3,522	3,541	3,628	3,564
		Muhlenberg	4,060	3,554	3,504	3,706
		Whitley	3,082	2,886	3,298	3,089
		Average	3,555	3,327	3,477	3,453
	½ Preplant ½ Postplant	Franklin	3,800	3,614	3,712	3,709
		Muhlenberg	3,634	3,590	3,691	3,638
		Whitley	2,891	2,912	2,812	2,872
		Average	3,442	3,372	3,405	3,406
	Average	Franklin	3,661	3,578	3,670	3,636
		Muhlenberg	3,847	3,572	3,598	3,672
		Whitley	2,986	2,899	3,055	2,980
		Average	3,498	3,350	3,441	3,429

Table 2.—1970 Nitrogen Rate and Source Test. Value/CWT, Dollars.

N Rate, lb/A	Time of Application	Location (County)	Nitrogen Source			
			KNO_3	UREA	NH_4NO_3	Average
200	All	Franklin	$73.42	$73.88	$72.90	$73.40
		Muhlenberg	75.58	74.64	75.09	75.10
		Average	74.50	74.26	74.00	74.25
	1/2 & 1/2	Franklin	72.90	73.58	74.18	73.55
		Muhlenberg	76.00	74.56	75.03	75.20
		Average	74.45	74.07	74.60	74.38
	Average	Franklin	73.16	73.73	73.54	73.48
		Muhlenberg	75.79	74.60	75.06	75.15
		Average	74.48	74.16	74.30	74.32
400	All	Franklin	72.56	71.58	72.63	72.26
		Muhlenberg	74.09	72.96	74.80	73.95
		Average	73.32	72.27	73.72	73.10
	1/2 & 1/2	Franklin	72.28	72.08	73.15	72.50
		Muhlenberg	75.51	74.62	74.58	73.70
		Average	73.90	73.35	73.86	73.70
	Average	Franklin	72.42	71.83	72.89	72.38
		Muhlenberg	74.80	73.79	74.69	74.42
		Average	73.61	72.81	73.79	74.90
Average	All	Franklin	72.99	72.73	72.76	72.83
		Muhlenberg	74.84	73.80	74.94	74.52
		Average	73.92	73.26	73.85	73.68
	1/2 & 1/2	Franklin	72.59	72.83	73.66	73.02
		Muhlenberg	75.76	74.59	74.80	75.05
		Average	74.18	73.71	74.23	74.04
	Average	Franklin	72.79	72.78	73.21	72.93
		Muhlenberg	75.30	74.20	74.87	74.78
		Average	74.04	73.49	74.04	73.86

Table 3.—1970 Nitrogen Rate and Source Test. Value Per Acre, Dollars.

N Rate, lb/A	Time of Application	Location (County)	Nitrogen Source KNO$_3$	UREA	NH$_4$NO$_3$	Average
200	All	Franklin	$2,603	$2,648	$2,576	$2,609
		Muhlenberg	2,898	2,338	2,624	2,620
		Average	2,750	2,493	2,600	2,614
	1/2 & 1/2	Franklin	2,752	2,708	2,724	2,728
		Muhlenberg	2,934	2,648	2,676	2,752
		Average	2,843	2,678	2,700	2,740
	Average	Franklin	2,678	2,678	2,650	2,668
		Muhlenberg	2,916	2,493	2,650	2,686
		Average	2,797	2,586	2,650	2,677
400	All	Franklin	2,538	2,505	2,699	2,581
		Muhlenberg	3,176	2,898	2,626	2,900
		Average	2,857	2,702	2,662	2,740
	1/2 & 1/2	Franklin	2,795	2,557	2,794	2,699
		Muhlenberg	2,610	2,707	2,844	2,720
		Average	2,702	2,632	2,794	2,709
	Average	Franklin	2,666	2,531	2,722	2,640
		Muhlenberg	2,893	2,802	2,735	2,810
		Average	2,780	2,667	2,728	2,725
Average	All	Franklin	2,570	2,576	2,638	2,595
		Muhlenberg	3,037	2,618	2,625	2,760
		Average	2,804	2,597	2,632	2,678
	1/2 & 1/2	Franklin	2,774	2,632	2,734	2,713
		Muhlenberg	2,772	2,678	2,760	2,736
		Average	2,773	2,655	2,747	2,725
	Average	Franklin	2,672	2,604	2,686	2,654
		Muhlenberg	2,904	2,648	2,692	2,748
		Average	2,788	2,626	2,689	2,701

EFFECT OF MINOR ELEMENTS ON YIELD OF BURLEY TOBACCO

J. H. Smiley, A. M. Wallace, J. L. Sims,
W. O. Atkinson, and George Everette

An experiment to determine the response of burley tobacco to molybdenum, zinc, boron, and magnesium was conducted at 11 locations in 7 counties in Kentucky. Sufficient nitrogen, phosphorus and potassium were applied for maximum yields. At each location, there was ample rainfall and good yields of tobacco were obtained. Yield data did not indicate a response for the application of any element (Table 1). No deficiency symptoms of any of the elements included in the test were apparent nor was there any indication of toxicity to the tobacco from the use of any element.

Table 1.—Effect of Minor Elements on Yield of Burley Tobacco, lb/A.

Location	Grower	Mo (1.5 oz/A)	Zn (3.0 lb/A)	B (0.3 lb/A)	Mg (25 lb/A)	Mg (50 lb/A)	Untreated
Woodford County	Jones	3,527	3,533	3,800	3,514	3,518	3,728
	Leach	3,357	3,514	3,763	3,466	3,378	3,322
Franklin County	Waits	3,232	3,043	3,244	2,963	3,162	2,964
	Smith	3,229	3,133	3,392	3,139	3,153	3,122
Bath County	Ellington	3,708	3,668	3,859	3,772	3,845	3,688
	Pettit	3,086	3,414	2,985	2,963	3,279	3,170
Madison County	Devere	3,237	3,431	3,197	3,304	3,319	3,388
	Combs	3,708	3,601	3,569	3,812	3,463	3,602
Nicholas County	Darrell	3,196	3,033	2,983	3,037	3,028	3,210
Hart County	England	3,300	3,054	3,209	3,491	3,265	3,069
Allen County	Whitlow	3,474	3,608	3,525	3,518	3,357	3,312
Average		3,368	3,367	3,411	3,362	3,342	3,325

BURLEY TOBACCO YIELDS, VALUES AND LABOR REQUIREMENTS FOR DIFFERENT PLANT POPULATIONS

W. O. Atkinson

Increasing the number of plants per acre is one way of obtaining higher acre yields and returns. A factor that should be considered, however, is the amount of labor involved when plant populations are altered. Since there are numerous operations such as transplanting, topping, harvesting and stripping, when each plant must be handled separately, more plants per acre mean more hours of labor used per acre.

The accompanying table gives acre yields, returns per acre and hours of labor per acre of burley tobacco from an experiment conducted at Lexington for three years. Burley 21 was grown using 200 lb per acre of nitrogen and irrigation when necessary. Labor records were maintained for all hand operations, such as transplanting, priming, topping, housing, etc., and data from previous work were used for calculating land and plant bed preparation, cultivation, etc.

Table 1.—Yield, Acre Returns and Hours of Labor per Acre of Burley Tobacco

	Plants per Acre[a]		
	8,000	10,000	13,400
Acre yields (lb)	2,710	3,023	3,152
Acre returns ($/A at 73¢ per lb)	1,978	2,206	2,300
Hours of labor per acre	312	387	500

[a] In rows 39 inches apart, plants spaced 20, 16 and 12 inches apart give acre populations of 8,000, 10,000, and 13,400, respectively.

It is evident that acre yields increased with each increase in number of plants grown per acre; however, labor requirements increased at a faster rate. Under the conditions of this experiment, increasing the plant population from 8,000 to 10,000 per acre increased gross returns per acre by $228, a realization of $3.04 per hour of additional labor. Increasing plant population from 10,000 to 13,400 per acre increased gross returns by $94 per acre or 83 cents per hour. These data suggest that populations much greater than 10,000 plants per acre would not pay for the additional labor required.

EFFECT OF HERBICIDES ON YIELD OF TOBACCO

J. H. Smiley and A. M. Wallace

Three registered herbicides (Balan, Enide, and Tillam) plus one experimental compound (El 179) were tested at two locations under cultural practices of cultivation (plowed two or more times) and no cultivation (no plowing and no hoeing) to determine their effect on weed and grass control and on yield of burley tobacco. Excellent annual grass control and acceptable weed control were obtained at all locations in both cultivated and noncultivated tobacco.

There was no significant difference in the average yield among herbicide treatments; however, average yields were nearly 200 lb per acre greater from cultivated than from noncultivated treatments. These tests indicate that cultivating (plowing) would be profitable when herbicides are used for weed control in burley tobacco fields.

Table 1.—Effect of Herbicides and Cultivation on Yield of Burley Tobacco, lb/A

		Herbicide Treatment				
Cultivation	Location	Balan	El 179	Enide	Tillam	Average
Cultivated	Scott Co.	2,983	3,114	2,970	3,005	3,018
	Boyle Co.	3,019	3,013	2,999	3,026	3,014
	Average	3,001	3,064	2,984	3,016	3,016
Not cultivated	Scott Co.	2,795	2,838	2,791	2,831	2,814
	Boyle Co.	3,008	2,706	2,886	2,822	2,855
	Average	2,902	2,772	2,838	2,826	2,834
Average	Scott Co.	2,889	2,976	2,880	2,918	2,916
	Boyle Co.	3,013	2,860	2,942	2,924	2,935
	Average	2,951	2,918	2,911	2,921	2,925

EFFECT OF TRANSPLANT SIZE AND ANTI-TRANSPIRANTS ON YIELD AND VALUE OF BURLEY TOBACCO

W. O. Atkinson and J. H. Smiley

The effect of Mobileaf, Folicote, and sizes of transplant on the yield of burley tobacco was measured in field plots replicated three times at Lexington during 1970. Small transplants (4 inches from ground to bud), medium transplants (8 inches from ground to bud), and large transplants (12 inches from ground to bud) were transferred to field plots: (1) without treatment, (2) pretreated with Mobileaf, and (3) pretreated with Folicote.

Table 1.—Effect of Plant Size and Anti-transpirant Materials on Yield of Burley Tobacco, lb/A

	Treatment			
Plant Size	Untreated	Mobileaf	Folicote	Average
Small	2,639	2,609	2,709	2,652a[1/]
Medium	2,714	2,800	2,788	2,767a
Large	2,271	2,438	2,288	2,332b
Average	2,541a	2,616a	2,595a	

1/ Averages followed by same letter are not significant at the 25% level for chemical treatments and at the 1% level for plant size.

Variety Burley 21 plants were pulled from the plant beds in the late morning and treated with anti-transpirants just prior to setting in late afternoon the same day. The following day the treated plants appeared to remain slightly more erect, but the differences were not striking.

Table 2.—Effect of Plant Size and Anti-transpirant Materials on Value per 100 lb of Cured Burley Tobacco

	Treatment			
Plant Size	Untreated	Mobileaf	Folicote	Average
Small	$71.88	$71.83	$72.20	$71.97
Medium	72.18	72.00	72.31	72.16
Large	71.77	72.64	71.76	72.06
Average	71.94	72.16	72.09	

Leaf yields from medium and small transplants differed only slightly but yields of large transplants were significantly lower. Mobileaf increased the yield 75 lb and Folicote increased the yield 54 lb per acre. These differences were not significant nor were there significant interactions between anti-transpirants and plant sizes. Values per 100 lb of cured leaf were not affected by plant size or by chemical treatment.

MOBILEAF ON BURLEY TOBACCO IN 1969-70

J. H. Smiley, W. O. Atkinson, and A. M. Wallace

Mobileaf is an anti-transpirant wax emulsion developed by Mobil Oil Corporation which is applied to the leaves of tobacco transplants prior to transplanting to the field. It was evaluated in 1969 on 10 farms in Kentucky and in 1970 on 6 farms under the supervision of personnel of the Agricultural Experiment Station and/or Cooperative Extension Service. Purpose of the investigation was to determine the effect of Mobileaf on the percent mortality and yield of burley tobacco.

Methods

Each year one test was conducted on the Experiment Station Farm at Lexington, and the other tests were on farms selected by County Agricultural Extension Agents.

The effect of an application of Mobileaf (dipping plants in a solution of 1 part Mobileaf, 5 parts water prior to transplanting) was compared with no treatment on the percent mortality and yield of burley tobacco.

Other cultural practices followed in the test varied from farm to farm but were in accordance with usual production practices for that particular farm and location. The experimental design was a randomized block with three replications. Each plot consisted of 1/50 acre at each farm.

Treated plants were selected from each farmer's plant bed and were representative of what the farmer used in his regular plantings. Except for dipping the leaves of treated plants in Mobileaf solution, both the treated and untreated plants were cared for during the period from pulling to transplanting in the conventional manner.

All plots were replanted within 7 days of the original transplanting date. In 1970 counts were made of the number of plants reset.

Results

There was no difference in the number of plants reset due to treatment (Table 1). Stand counts were not made in 1969; however, the growers indicated almost perfect stands were obtained for both treated and untreated plants.

Yield data at each location and average yield for the 10 locations in 1969 and the 6 locations for 1970 are shown in Table 2. Average yields for treated and untreated tobacco were not different at the 25% level of significance. In 1969 at 6 of the 10 locations, yield of Mobileaf treated tobacco was higher than untreated tobacco; the increases ranged from 15 to 188 lb per acre. The average of 22 lb per acre more for Mobileaf-treated tobacco indicated the gross acre income would have been increased by $15.29, assuming no difference in quality and that all tobacco averaged $69.50 per 100 lb, the average market price for the 1969 crop. The cost of Mobileaf and the additional labor required to apply it to plants would probably equal, or surpass, the average increased gross return per acre. Therefore, it appears that treating burley tobacco with Mobileaf would not have been profitable in 1969.

In 1970 at four of the six locations, yield of the Mobileaf-treated tobacco was higher than that of the untreated tobacco; the increases ranged from 83 to 157 lb per acre. Average yields for treated and untreated tobacco were not different at the 25% level of significance. It is our feeling that treating burley tobacco with Mobileaf would not have been profitable in 1970.

Table 1.—Percent Mortality of Untreated Burley Tobacco and Plants Treated with Mobileaf, 1970

Location (County)	Untreated	Treated
Owsley	1.5	2.0
Taylor	0.0	0.0
Grant	2.7	4.7
Clinton	10.6	9.2
Muhlenberg	0.0	0.0
Fayette	0.0	0.0
Average	2.5	2.6

Table 2. —Yields of Cured Burley Tobacco from Anti-transpirant test, 1969-70

Location (County)	Lb per Acre Untreated	Treated
	1969	
Washington	3,556	3,598
Henry	2,641	2,746
Green	3,042	2,919
Caldwell	2,460	2,398
Franklin	3,293	3,244
Allen	2,817	2,795
Shelby	3,069	3,084
Owen	3,093	3,145
Rowan	2,975	3,047
Fayette	2,955	3,143
Average 1969*	2,990	3,012
	1970	
Owsley	2,847	2,930
Taylor	4,064	4,221
Grant	2,845	2,934
Clinton	3,224	3,123
Muhlenberg	3,332	3,256
Fayette	2,714	2,800
Average 1970*	3,161	3,211

*Differences between treatments were not significant at 25% level for either 1969 or 1970.

FOLICOTE ON BURLEY TOBACCO IN 1970

J. H. Smiley, W. O. Atkinson, and A. M. Wallace

Folicote is an anti-transpirant wax emulsion developed by Sun Oil Corporation which is applied to the leaves of tobacco transplants prior to transplanting to the field. It was evaluated in 1970 on four farms under the supervision of personnel of the Agricultural Experiment Station and/or Cooperative Extension Service. Purpose of the investigation was to determine the effect of Folicote on the percent mortality and yield of burley tobacco.

Methods

One test was conducted on the Agricultural Experiment Station Farm at Lexington, and the other tests were on farms selected by County Agricultural Extension Agents.

The effect of an application of Folicote (dipping plants in a solution of 1 part Folicote, 19 parts water prior to transplanting) was compared with no treatment on the percent mortality and yield of burley tobacco.

Other cultural practices followed in the test varied from farm to farm but were in accordance with usual production practices for that particular farm and location. The experimental design was a randomized block with three replications. Each plot consisted of 1/50 acre at each farm.

Treated plants were selected from each farmer's plant bed and were representative of what the farmer used in his regular plantings. Except for dipping the leaves of treated plants in Folicote solution, both the treated and untreated plants were cared for during the period from pulling to transplanting in the conventional manner.

All plots were replanted within seven days of the original transplanting date. Counts were made of the number of plants reset.

Results

There was no difference in the number of plants reset because of treatment (Table 1).

Table 1.—Percent Mortality of Untreated Burley Tobacco Plants and Plants Treated with Folicote, 1970

Location (County)	Untreated	Treated
Taylor	0.00%	0.00%
Clinton	8.17	8.73
Muhlenberg	0.00	0.00
Fayette	0.00	0.00
Average	2.04	2.18

Yield data at each location and average yield for the four locations are shown in Table 2. At two of the four locations, yield of Folicote-treated tobacco was higher than that of untreated tobacco, while at two locations the yield of Folicote-treated tobacco was lower than that of untreated tobacco. Average yields for treated and untreated tobacco were not different at the 25% level of significance.

It is our feeling that treating burley tobacco with Folicote would not have been profitable in 1970.

Table 2.—Yields of Cured Burley Tobacco from Folicote Test, 1970

Location	Lb per Acre	
(County)	Untreated	Treated
Taylor	4,064	4,225
Clinton	3,224	3,197
Muhlenberg	3,273	3,000
Fayette	2,714	2,788
Average	3,319	3,278

*Differences between treatments were not significant at 25% level.

FOLIAR FERTILIZATION OF BURLEY TOBACCO

W. O. Atkinson and J. H. Smiley

The use of a liquid, complete fertilizer (10-20-10) in water solution sprayed onto field grown tobacco plants was investigated. The liquid fertilizers are considerably more expensive per unit of plant food than are solid mixed fertilizers. For this reason, the experiment was not designed to provide all the nutrients as liquid fertilizer. A basic application of 140 lb of nitrogen, 70 lb phosphorus and 200 lb potassium per acre as solid fertilizer was broadcast on all plots in the experiment. Five treatments, replicated four times, were superimposed on the basic fertilizer application as follows:

1) No additional fertilizer.
2) 2 gallons per acre of 10-20-10 sprayed on plants at topping time.
3) 6 gallons per acre of 10-20-10 sprayed on plants at 30 and 45 days after transplanting and at topping (2 gallons per treatment each time).
4) 10 gallons per acre of 10-20-10 sprayed on plants at 15, 30, and 45 days after transplanting, at topping, and 15 days after topping (2 gallons per treatment each time).
5) Dry fertilizer to give the same amount of nutrients supplied by treatment 4, side-dressed 30 days after transplanting.

There were no observable differences in growth or flowering time for any of the five treatments. Cured tobacco yields from the experiment are shown in Table 1.

Table 1.—Yields of Burley Tobacco Fertilized with Foliar Applied Fertilizer and Dry Fertilizer

Treatments	Total Lb/A of Nutrients Used N	P	K	Yield Lb/A
1. No additional fertilizer	140.0	70.0	200.0	2,720
2. 2 gal liquid 10-20-10 per acre	142.4	72.1	202.0	2,581
3. 6 gal liquid 10-20-10 per acre	147.2	76.3	206.0	2,755
4. 10 gal liquid 10-20-10 per acre	152.0	80.5	210.0	2,752
5. Solid fert. equiv. to Tr. 4	152.0	80.5	210.0	2,752

SUCKER CONTROL EXPERIMENTS WITH BURLEY TOBACCO, INCLUDING TYPE OF CHEMICAL, RATES, SPLIT APPLICATIONS AND SEQUENTIAL TREATMENTS

J. H. Smiley, W. O. Atkinson, and A. M. Wallace

Reports have been received from farmers of increased tobacco yields resulting from larger amounts or split applications of sucker control chemicals and, more recently, the application of both contact and systemic type chemicals sequentially. The objectives of the experiment reported here were to evaluate the influences on burley tobacco of (1) single and multiple applications of different rates of a systemic sucker control chemical, (2) single applications of a contact chemical, and (3) treatment with a contact followed by a systemic sucker control chemical.

Methods

Replicated field tests were conducted at five locations in 1970 using a systemic or a contact sucker control chemical singly and in a combination. Tobacco plants were topped in early flower (50% of plants had at least one flower open), and the following sucker control treatments were started immediately.

1. 10 qt/A Royal MH-30.
2. 10 qt/A Royal MH-30, followed in 10 days by 6 qt/A Royal MH-30.
3. Hand suckered 10 days after topping, followed by 6 qt/A Royal MH-30.
4. 16 qt/A Royal MH-30.
5. 6 qt/A Royal MH-30, followed in 10 days by 6 qt/A Royal MH-30.
6. 3 gal/A OFF-SHOOT-T, followed in 10 days by 10 qt/A Royal MH-30.
7. 3 gal/A OFF-SHOOT-T.
8. 3 gal/A OFF-SHOOT-T, followed in 10 days by 6 qt/A Royal MH-30.

Suckers from all plants on each plot were removed, counted, and weighed before the tobacco was harvested. After curing was completed, the plots were stripped into farm grades and weighed.

Table 1.—Sucker Data, Leaf Yield and Average Value per 100 Lb for Sucker Control Tests in 1970

Treatment	No. per plant	Gm/plant	Cured Leaf Yield, lb/A	Average of 3 Locations, $/100 lb
1. 10 qt/A R MH-30	0.8	8	3,310	75.03
2. 10 + 6 qt/A R MH-30	0.4	6	3,316	75.07
3. H.S. + 10 qt/A R MH-30	1.0	10	3,257	-----1/
4. 16 qt/A R MH-30	0.5	7	3,314	75.19
5. 6 + 6 qt/A R MH-30	0.6	10	3,297	-----
6. OFF-SHOOT-T, 3 gal/A + 10 qt/A R MH-30	0.7	35	3,279	74.61
7. OFF-SHOOT-T, 3 gal/A	1.6	92	3,296	74.68
8. OFF-SHOOT-T, 3 gal/A + 6 qt/A R MH-30	0.8	21	3,370	-----

1/ Tobacco from these treatments was not graded.

Results

Sucker numbers and weights and leaf yields are shown in Table 1 for all locations. The average values per 100 lb of cured tobacco for certain treatments are shown for three locations.

Sucker control was very good for all chemical treatments except OFF-SHOOT-T used alone; however, yield was not lowered by the poorer sucker control. Yields generally were not greatly influenced by sucker control treatments and no evidence was apparent that split applications, heavier dosages, or combination treatments increased yields or affected average value per 100 lb of cured tobacco.

YIELD AND VALUE OF BURLEY 21 TOBACCO AS INFLUENCED BY NITROGEN NUTRITION, SUCKERING PRACTICE, AND HARVEST DATE

J. L. Sims and W. O. Atkinson

An experiment was conducted during 1966 on Maury silt loam soil to obtain information of the effects of agronomic factors on yield and value of Burley 21 tobacco. Ammonium nitrate fertilizer at varying rates, and concentrated superphosphate and potassium sulfate at constant rates were broadcast and disked in after plowing and before transplanting. All plots received irrigation water (sprinkler system) to supplement rainfall when soil moisture dropped below about 60% of available moisture-holding capacity. Sucker control practices utilized were (a) no topping - no suckering, (b) topping - no suckering, (c) topping - hand suckering, and (d) topping - MH-30. Half of the tobacco was harvested early (about 1 week prior to maturity) and half late (1 week past maturity). However, N fertilization at the 400 lb/acre N rate delayed maturity about 2 weeks beyond that for tobacco treated at the 100 and 200 N rates. Thus all the early harvests were made 1 week prior to maturity, the 100- and 200-lb N treated plots 2 weeks later, and the 400-lb N plots 4 weeks after the early harvest.

Suckering practice greatly influenced yields of cured leaf but the effects were not the same at both harvest dates (Table 1). In plots not topped or suckered, or in plots topped but not suckered, yields were higher at early harvest than late. In contrast, in plots where suckers were controlled by hand suckering or MH-30 treatment yields were highest at late harvest. The lower weights of late-harvested tobacco that had not been topped or suckered could be the result of movement of dry matter from leaves to tops and suckers or from greater loss of lower leaves. The high weights of late-harvested, suckered tobacco resulted from dry matter production over a longer period of time and the dry matter produced being largely retained in the leaves. MH-30-treated plots, which had the best sucker control, produced 3,038 lb of leaf per acre whereas plots with plants not topped or suckered (least sucker control) yielded only 2,375 lb of leaf. The high yields from the MH-30-treated plots presumably resulted from the better control of suckers by this chemical than other suckering practices. However, other data indicate that stalk weight of MH-30 plants also was lower than in other treatments. Suckering practice affected value per cwt very little (Table 1). Value per acre increased with degree of sucker control. Tobacco treated with MH-30 produced leaf valued at about 400 dollars per acre more than tobacco not topped or suckered and nearly 200 dollars per acre more than hand suckered tobacco.

Table 1.—Influence of suckering practice and harvest date on yield and value of Burley 21 leaf

Suckering Practice	Harvest Time	Yield, lb/Acre	Value, Dollars/Cwt	Value, Dollars/Acre
No Topping	early	2, 468	63. 63	1, 571
	late	2, 281	64. 50	1, 472
	avg	2, 375	64. 06	1, 521
No Suckering	early	2, 688	66. 11	1, 777
	late	2, 446	65. 47	1, 600
	avg	2, 567	65. 79	1, 689
Hand Suckering	early	2, 711	64. 75	1, 775
	late	2, 837	62. 47	1, 772
	avg	2, 774	63. 61	1, 764
MH-30	early	2, 920	65. 23	1, 904
	late	3, 157	63. 36	2, 001
	avg	3, 038	64. 30	1, 953

Generally, the per acre yield of cured leaf increased as rate of N fertilizer increased. Cured leaf yields respectively were 2, 571, 2, 738, and 2, 756 lb per acre for the 100, 200, and 400 lb per acre N fertilizer rates (Table 2). However, there was no significant yield advantage from applying N at the 400 lb rate over the 200 lb rate.

Table 2.—Effect of Nitrogen Level and Harvest Date on Value of Burley 21 Leaf

Nitrogen Level	Harvest Time	Yield lb/Acre	Value Dollars/Cwt	Value Dollars/Acre
lb/Acre				
100	early	2, 522	64. 88	1, 639
	late	2, 620	66. 29	1, 737
	avg	2, 571	65. 59	1, 688
200	early	2, 759	64. 58	1, 782
	late	2, 717	65. 56	1, 777
	avg	2, 738	65. 07	1, 779
400	early	2, 809	65. 34	1, 835
	late	2, 703	59. 99	1, 620
	avg	2, 756	62. 66	1, 728

At the 100-lb N rate both dollars per cwt and per acre tended to be higher at late harvest than early harvest, whereas the reverse was true for the 400-lb N rate (Table 2). When N was applied at the rate of 200 lb per acre, harvest date had no effect on value. The decrease in value per acre between early and late harvests for the 400 N treatment resulted primarily from a decrease in value per cwt. Nearly 2½ inches of rain fell between early and late harvest for the 400 N treatments, causing green tobacco and lowered quality after curing. Consequently, applying excessive amounts of N fertilizer delays maturity and increases greatly the chances of unfavorable weather, e.g. rain, wind, hail or frost near harvest time. Additionally, excessive amounts of N may increase soil acidity and cause toxicity problems with manganese and other minor elements.

THE EFFECT OF TIME OF TOPPING AND HARVESTING ON YIELD AND VALUE OF BURLEY TOBACCO

A. M. Wallace, J. H. Smiley, W. O. Atkinson, and J. L. Sims

Burley tobacco, variety Ky 14, was grown at three locations in Kentucky in 1970 to determine the effect of time of topping and harvesting on the yield and value of the cured leaf. Two stages of maturity at topping time and three harvest dates were employed. Topping was done in the button stage and 10 days later when about 50 percent of the plants had at least one flower open. Suckers were controlled by spraying with maleic hydrazide immediately after topping. Harvesting was done at 10-, 20-, and 30-day intervals after each topping time. Each of the six treatments was replicated three times at each location.

Yield was increased significantly ($P = .01$) for each delay in harvest at both topping times, and yield of the later topped tobacco was significantly greater ($P = .10$) than for the early topped tobacco, Table 1. Values per hundredweight were generally not affected by treatments; therefore, values per acre followed the same trend as yields (Tables 2 and 3).

Based on this study, it would appear that it would be advisable to top when about 50 percent of the plants have at least one flower open and to delay harvesting as long as feasible.

Table 1.—Effect of Time of Topping and Harvesting on Yield of Burley Tobacco

Topping Stage	Harvest (Days After Topping)	Yield (Lb/acre) Nelson Co.	Scott Co.	Casey Co.	Average 3 Locations
	10	2,128	3,069	2,372	2,523
Button Stage	20	2,396	3,246	2,491	2,711
	30	2,764	3,486	2,551	2,934
	average	2,429	3,267	2,471	2,723
	10	2,232	2,999	2,404	2,545
50% Flower	20	2,586	3,233	2,719	2,846
	30	2,761	3,522	2,756	3,013
	average	2,526	3,251	2,626	2,801
	10	2,180	3,034	2,388	2,534
Average	20	2,491	3,240	2,605	2,779
	30	2,762	3,504	2,654	2,973

Table 2.—Effect of Time of Topping and Harvesting on Value per Hundred Weight of Burley Tobacco

Topping Stage	Harvest (Days After Topping)	Value per Hundredweight Nelson Co.	Scott Co.	Average 2 Locations
Button Stage	10	74.04	73.10	73.57
	20	73.66	74.80	74.23
	30	73.42	74.97	74.20
	average	73.71	74.29	74.00
50% Flower	10	73.39	74.36	73.88
	20	73.74	74.45	74.10
	30	72.00	74.63	73.32
	average	73.04	74.48	73.76
Average	10	73.72	73.73	73.72
	20	73.70	74.62	74.16
	30	72.71	74.80	73.76
	average	73.38	74.38	73.88

Table 3.—Effect of Time of Topping and Harvesting on Value of Burley Tobacco

Topping Stage	Harvest (Days After Topping)	Value per Acre Nelson Co.	Scott Co.	Average 2 Locations
Button Stage	10	1,576	2,243	1,910
	20	1,765	2,424	2,094
	30	2,029	2,613	2,321
	average	1,790	2,427	2,108
50% Flower	10	1,638	2,230	1,934
	20	1,907	2,407	2,157
	30	1,988	2,628	2,308
	average	1,845	2,421	2,133
Average	10	1,607	2,237	1,922
	20	1,836	2,418	2,127
	30	2,008	2,621	2,314

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