Irrigation Experiments on Oriental Tobacco*

by A. G. Sficas

Tobacco Institute of Greece, Drama, Greece

INTRODUCTION

The amount of available water markedly affects the growth and development of the tobacco plant (2). Yield is increased by irrigation when rainfall is low and poorly distributed. Leaf quality is also affected depending on the type of tobacco.

Greek oriental tobacco is of two main types, aromatic and neutral. Irrigation of neutral types (Kaba-Koulak) is a general practice and is accepted to be beneficial to both yield and quality. With respect to aromatic tobacco it is generally believed that irrigation is detrimental to quality. Crops are of inferior quality in dry years compared with moderately wet ones. Only in very rainy years is a portion of the crop of lower quality as a result of excess water. However, a number of farmers are using moderate amounts of irrigation for aromatic tobacco to improve crop appearance and yield.

Irrigation experiments were conducted to study some of the problems involved.

TREATMENTS

The experiments were conducted at the Tobacco Institute of Drama and the Tobacco Research Station

of Xanthi during the four years 1966–1969. During the first two years, 1966 and 1967, at Drama 50 mm applied in two irrigations of 20 and 30 mm, 80 mm applied in three irrigations of 30, 30 and 20 mm, and no irrigation were compared. An aromatic (basma) variety was used and the experiments consisted of four replications in a completely randomised design. In 1968 and 1969 at both Drama and Xanthi four levels of irrigation were compared. These were 40 mm (two irrigations of 20 mm each), 60 mm (two irrigations of 30 mm each), 80 mm (two irrigations of 30 mm each plus one of 20 mm) and no irrigation. These experiments were of factorial design and at Drama only split for topping and no topping and two plant spacings, 15 and 12.5 cm. Row spacing was 40 cm. Different aromatic (basma) varieties were used at the two sites. A similar experiment with a neutral (Kaba-Koulak) variety was conducted at Drama in one of the two years.

In all experiments the first irrigation was applied at the beginning of July and subsequent ones were made at 17-day intervals. Where applicable, the plants were topped late and high and standard spacings were used.

Monthly rainfall and days of rain are given in Table 1 for the period October of the previous year to September of the current year for all four years.

Table 1. Monthly rainfall in mm from 1965–66 to 1968–69 at Drama.

	O		N		D		J		F		M		A		M		J		J		A		S		Total
	mm	D.	mm	D.	mm	D.	mm	D.	mm	D.	mm	D.	mm	D.	mm	D.	mm	D.	mm	D.	mm	D.	mm	D.	
1965-66	5.5	1	42.5	12	92.4	13	131.4	16	15.3	4	48.4	11	57.6	9	49.4	9	73.0	7	19.3	3	28.2	4	28.7	4	591.7
1966-67	176.4	7	161.7	13	88.1	7	42.0	5	17.7	2	59.5	3	74.4	4	209.1	8	56.6	8	50.8	8	15.0	7	30.7	7	975.0
1967-68	48.7	4	0.8	1	85.6	10	61.4	6	115.2	6	66.1	6	8.5	1	22.4	3	61.9	6	21.9	3	4.9	2	15.6	5	513.0
1968-69	34.6	2	75.6	8	69.5	9	102.7	11	97.5	11	95.2	10	34.3	8	10.2	5	59.8	8	11.6	7	8.9	6	17.6	2	617.5
Total	265.2		280.6		245.6		337.5		245.7		269.2		174.8		284.1		251.3		103.6		57.0		92.6		
Mean	66.3		70.1		61.4		89.4		61.4		67.3		43.7		71.0		62.8		25.9		13.8		23.2		

* Presented at the 5th International Tobacco Scientific Congress, Hamburg, September 1970.

D = rain days.

Table 2. Results of a two-year preliminary irrigation experiment with an aromatic (basma) variety.

	Yield kgs/str.		Grades I/III %		Relative quality index (2°-5° priming)	
	1966	1967	1966	1967	1966	1967
Control	93.6	106.2	80.6	82.3	31.5	33.5
50 mm	116.4	128.4	81.5	85.2	35.5	34.0
80 mm	125.8	140.2	84.2	86.3	34.0	34.0
L.S.D. .05		6.7		2.5		
.01		9.5		3.6		
C.V. %		4.2		2.4		

RESULTS

A. Aromatic Tobacco

The 1966 yield, proportion of first quality (I/II) and relative quality index (sum of marks of 2nd to 5th primings) results from Drama are given in Table 2. Irrigation increased yield by 20–30%, the proportion of first quality by 4–5% and improved the quality index.

The data for the next two years (1968 and 1969) are given in Table 3. They can be summarised as follows:

1. Irrigation at the moderate rates used in these experiments, up to 80 mm, increased yield from 30 to 80%, the greater response being obtained at Xanthi.
2. Quality was improved and the proportion of better grades increased by 2–10%. Again, the greater response was at Xanthi.
3. Nicotine content was significantly decreased by irrigation.
4. Topping significantly increased yield and nicotine content in 1969.
5. Closer spacing significantly increased yield but decreased nicotine content as expected.

All data in four successive years, of which one rather wet one (1967), indicate the beneficial response of aromatic tobacco to moderate irrigation. Quality was improved parallel to the yield increase.

B. Neutral (Kaba-Koulak) Tobacco

Similar data with neutral tobacco are given in Table 4 obtained from an experiment conducted at Drama in 1969, from which the following conclusions can be drawn:

1. Yield increased with irrigation from 20–30%.
2. Irrigation improved the quality index significantly.
3. Nicotine content was significantly decreased with irrigation.
4. Planting distances (60 × 15 and 60 × 20) did not give significant differences.
5. Topping resulted in higher yield per stremma.

Table 4. Yield and quality of neutral (non-aromatic) oriental tobacco as affected by irrigation, topping and spacing.

	Yield kgs/str.	1st quality grades I/III %	Relative quality index of 1st grades	Nicotine %
Control	131.1	78.7	32.5	0.71
40 mm	154.8	78.4	34.5	0.66
60 mm	154.9	73.8	35.7	0.61
80 mm	166.4	73.7	35.4	0.59
L.S.D. .05	21.8	N.S.	1.0	0.076
.01	N.S.	N.S.	1.5	0.114
C.V. %	11.7	7.8	1.9	12.3
Topped	161.7	78.4	34.6	0.63
Non-topped	141.5	73.8	34.4	0.66
L.S.D. .05	19.9	N.S.	N.S.	N.S.
Distance 60x15	147.4	75.2	34.5	0.65
Distance 60x20	156.2	77.0	34.4	0.64
L.S.D. .05	N.S.	N.S.	N.S.	N.S.

Table 3. Yield and quality of aromatic tobacco as affected by irrigation, topping and spacing.

	Yield kgs/str.			Grades I/III %			Relative quality index			Nicotine %	
	Drama		Xanthi	Drama		Xanthi	Drama		Xanthi	Drama	
	1968	1969	1969	1968	1969	1969	1968	1969	1969	1968	1969
Control	96.8	117.8	72.0	88.8	70.1	76.6	33.1	34.1	27.2	1.84	1.52
40 mm	119.1	136.0	86.2	92.1	72.0	79.6	33.4	33.7	28	1.73	1.47
60 mm	130.1	147.7	101.9	92.2	71.4	81.0	33.7	33.5	29	1.75	1.23
80 mm	128.8	153.5	135.2	92.2	72.1	84.5	33.7	33.9	28	1.72	1.31
L.S.D. .05	11.0	11.7	23.3	2.6	N.S.	5.9	N.S.	N.S.	0.1	0.12	0.11
.01	14.1	17.7	35.2	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.	0.14
C.V. %	5.3	5.1	11.6	1.8	3.12	3.7	2.7	2.75	1.63	10.8	10.1
Topped	120.7	144.6		91.6	75.2		33.4	33.5		1.74	1.49
Non-topped	116.8	138.8		91.0	67.5		33.6	34.0		1.76	1.28
L.S.D. .05	N.S.	6.1		N.S.	2.8		N.S.	N.S.		N.S.	0.07
.01	N.S.	N.S.		N.S.	3.4		N.S.	N.S.		N.S.	0.10
Plant distance											
40 x 12.5	119.2	143.4		90.6	70.0		33.9	33.8		1.79	1.28
40 x 15	118.3	134.0		92.1	72.8		33.1	33.8		1.74	1.49
L.S.D. .05	N.S.	8.3		N.S.	2.7		N.S.	N.S.		N.S.	0.07
.01	N.S.	N.S.		N.S.	N.S.		N.S.	N.S.		N.S.	0.09

The results presented above are in general agreement with conclusions reached by other workers (1, 3, 4, etc.), provided that frequency of irrigation and amount of water applied differ with the type of tobacco and ecological conditions.

With respect to rainfall (see Table 1) only year 1967 could be considered as rather wet. Even in this case irrigation had no adverse effects on quality, with the moderate rates applied.

The compared planting distances of the years 1968 and 1969 were the ones commonly used for the tobacco types planted in these experiments and their small differences observed due to topping were not substantial because of its late and high application.

It can be concluded that in years of low rainfall, irrigation is necessary for obtaining an average yield of high quality leaf. Even in years when rainfall is high, but poorly distributed, irrigation could be necessary at crucial stages of plant growth to increase yield and improve quality.

Stages of plant growth, soil texture and soil moisture content will guide irrigation frequency and amount of water to be used for the various types of tobacco. Occurrence of rainfall during the growing season should also be considered.

Comparing oriental types to other tobaccos the former are more drought tolerant (5) and have lower water requirements for optimum quality. Moderate irrigation at the rates of 60–80 mm in 2–3 applications seems to be most appropriate. Higher doses could be given to neutral oriental tobacco, but they should not be exceeded for aromatic varieties.

SUMMARY

Irrigation experiments were conducted at the Tobacco Institute of Drama and the Tobacco Research Station of Xanthi on aromatic and on neutral (Kaba-Koulak) tobacco. Both tobacco types benefited highly from a moderate water supply from 40–80 m³ per stremma. Yield was increased by about 20–30% and quality was also significantly improved. Nicotine content was reduced in a proportion of 5–10%. In the aromatic types, topping and close spacing gave significantly higher yield per stremma. The nicotine level was higher with topping and lower with close spacing.

Mit aromatischen und neutralen (Kaba-Koulak) Tabaken wurden im Tabakforschungsinstitut in Drama und in der Versuchsstation Xanthi Bewässerungsversuche durchgeführt. Bei beiden Tabakarten wirkte eine mäßige Bewässerung von 40 bis 80 m³ je Stremma (1000 m²) sehr günstig. Der Ertrag stieg um 20 bis 30% an, und die Qualität wurde wesentlich verbessert. Der Nikotingehalt wurde um 5 bis 10% vermindert. Bei den aromatischen Tabaken stieg der Ertrag je Stremma (1000 m²) durch Köpfen und geringe Pflanzweite beträchtlich an. Der Nikotingehalt wurde durch das Köpfen erhöht und durch geringe Pflanzweite vermindert.

RESUME

A l'Institut du Tabac de Drama et à la Station de Recherche sur le Tabac de Xanthi, des expériences d'irrigation ont été faites sur des tabacs aromatiques et de remplissage (Kaba-Koulak). Ces deux types de tabac ont fortement bénéficié d'un apport d'eau modéré, 400–800 m³/ha. Le rendement a été accru de 20–30% et la qualité a été significativement améliorée. Le taux de nicotine a été diminué de 5–10%. Dans les types aromatiques, l'écimage et une densité de plantation élevée ont accru significativement le rendement/ha. L'écimage accroissait la teneur en nicotine et la densité de plantation élevée l'abaissait.

REFERENCES

1. Chouteau, J., Renier, A., Mounat, A., and Hitier, H.: *Annales SEITA* 1 (1964) 35.
2. Goodall, D. W.: 2nd Int. Tob. Sci. Congress, Brussels, 1958, p. 175.
3. Papenfus, H. D., and Baxter, D. A.: *Tob. Forum*, Rhod. 33 (1969) 5.
4. Patel, G.: *Indian Tob.* 24 (1964) 179.
5. Sficas, A. G., Jones, G. L., and Seltmann, H.: *Tob. Sci.* 5 (1961) 39.

The author's address:

*Tobacco Institute,
Drama, Greece.*