



Effect of fertilizer and weed management practices on growth and yield of *bidi* tobacco

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ABSTRACT

An experiment was conducted on loamy sand soil at *Bidi* Tobacco Research Station Farm, Anand Agricultural University, Anand, Gujarat during 2011-12 and 2012-13. Twenty treatment combinations comprising of four levels of fertilizer management (control; ammonium sulphate: 200 kg/ha; castor cake: 200 kg/ha and neem cake: 200 kg/ha) and five weed management treatments (unweeded, manual weeding, pendimethalin 1.0 kg/ha, isoproturon 1.0 kg/ha and glyphosate 1.0 kg/ha) were tried out in a factorial RBD with four replications. The application of ammonium sulphate at 200 kg/ha along with irrigation and manual weeding of broomrape were found to be the best practices.

Tobacco (*Nicotiana tabacum* L.) is the most important non-food crop cultivated in more than 100 countries on approximately 4.2 million hectares of land (Anonymous. 2010). The major tobacco growing countries in the world are China, USA, India, Brazil, Turkey, Russia, Italy and Zimbabwe. Tobacco (*Nicotiana tabacum* L. and *Nicotiana rustica* L.) belongs to the order tubiflorae and family solanaceae and is believed to have been introduced in India from its native Central America by Portuguese in 1603.

In India, tobacco cultivation is grown mainly in Andhra Pradesh, Gujarat, Karnataka, Uttar Pradesh, Bihar, West Bengal, Maharashtra and Tamil Nadu. Chewing Tobacco is grown in Tamil Nadu, Gujarat, Bihar, West Bengal and Uttar Pradesh. Gujarat is the largest *Bidi* tobacco growing state in the country. (Anonymous 2006). In Gujarat, it is grown in Anand, Kheda, Vadodara and Panchmahal districts covering an area of around 90,000 ha. (Patel and Laxminarayan, 2006). The area, production and productivity of *bidi* tobacco cultivated in Kheda district during the year 2011-12 was 26400 (ha), 390 ('00' MT) and 14.75 (q/ha), respectively. (Anonymous 2012).

Bidi tobacco industry is essentially a cottage industry employing more than 30 lakh of rural population in India. *Bidi* tobacco plays a vital role in the national economy in generating employment and revenue. Gujarat is the largest *Bidi* tobacco growing state in the country. (Anonymous 2006). Among different types of tobacco grown in the country, *Bidi*

tobacco (*Nicotiana tabacum* L.) accounts for the highest area (32% of total) and production (36% of total) in the country.

Considering the importance of different management practices on growth and yield of *bidi* tobacco, the present experiment was conducted with an objective to study the effect of different fertilizer and weed management practices on growth and yield of *bidi* tobacco (*Nicotiana tabacum* L.) under middle Gujarat conditions.

A field experiment was conducted during the June to March of the years 2011-12 and 2012-13 at *Bidi* Tobacco Research Station, Anand Agricultural University, Anand, Gujarat. The texture of the soil is loamy sand. The soil is very deep and fairly moisture retentive. The soil was low in organic carbon and nitrogen, high in available phosphorus and medium in potassium with pH 7.6. The soil was free from any kind of salinity/sodicity hazards. Twenty treatment combinations comprising of four fertilizer management treatments, *viz.* control; ammonium sulphate: 200 kg/ha; castor cake: 200 kg/ha and neem cake: 200 kg/ha and five herbicide management treatments, *viz.* unweeded, manual weeding, pendimethalin 1.0 kg/ha, isoproturon 1.0 kg/ha and glyphosate 1.0 kg/ha were evaluated in a factorial RBD with four replications.

Effect of different fertilizer management treatments

The plant height and leaf length measured at harvest due to different fertilizer management

treatments were found non-significant during the year 2011-12, 2012-13 and on pooled analysis.

Different fertilizer management did not significantly influenced leaf width measured at harvest during both the years. However pooled analysis, ammonium sulphate 200 kg/ha recorded significantly higher leaf width (27.27 cm) which was statistically at par with treatment neem cake 200 kg/ha and castor cake 200 kg/ha. The nitrogen applied through ammonium sulphate might be responsible for vegetative growth of tobacco crop. Significantly lower leaf width (25.66 cm) was found in control. This could be attributed to severe crop weed competition wherein weeds had utilized in control. Results are in conformity with those of Abu-Irmaileh (1981), Westwood and Foy (1999) and Mariam and Suwanketnikom (2004).

With regard to cured leaf yield, ammonium sulphate 200 kg/ha has recorded significantly higher cured leaf yield (2.2 t/ha) and control has recorded lower cured leaf yield (1.98 t/ha) in pooled analysis. However both these treatments remained statistically at par with castor cake 200 kg/ha and neem cake 200 kg/ha. Treatment ammonium sulphate, 200 kg/ha indicated 12.2% higher cured leaf yield as compared to the treatment control (Table 1). It might be due to all broomrape species were much more sensitive to ammonium toxicity than host crop species under similar treatment conditions. Hence, broomrape infestation in *bidi* tobacco was drastically reduced and cured leaf yield was increased when $(\text{NH}_4)_2\text{SO}_4$ was applied. The results are in accordance with the results reported by Abu-Irmaileh (1981), Westwood

and Foy (1999) and Mariam and Suwanketnikom (2004).

In case of stalk yield, the differences were found non-significant due to different levels of management through fertilizers.

Effect of different weed management treatments

Different herbicide treatments were found equally effective on plant height. Among different weed management treatments, manual weeding recorded significantly the highest leaf length (50.16, 42.98 and 46.57 cm), respectively during the years 2011-12, 2012-13 and on pooled basis. The minimum values of weed density and weed biomass as well as dry weight of broomrape at harvest in manual weeding could be the reason for higher leaf length. These results are in agreement with the findings of Krishnamurthy and Rao (1976) and Ramchandra Prasad (2011).

Significantly the highest leaf width was observed with manual weeding during both the years (2011-12, 2012-13) and on pooled basis (29.51, 28.33 and 28.92 cm) respectively.

With respect to average cured leaf yield, manual weeding recorded significantly higher cured leaf yield (2.23 t/ha) which was statistically at par with pendimethalin 1.0 kg/ha, isoproturon 1.0 kg/ha and glyphosate 1.0 kg/ha treatments. On the contrary, unweeded control gave significantly lower cured leaf yield (1.94 t/ha) on pooled data. Manual weeding recorded 15.1% higher cured leaf yield as compared to unweeded control. Higher dry matter production of tobacco leaves with manual weeding of broomrape

Table 1. Growth and yield attributes at harvest of *bidi* tobacco as influenced by fertilizers and weed management

Treatment	Plant height (cm)			Leaf length (cm)			Leaf width (cm)		
	2011-12	2012-13	Pooled	2011-12	2012-13	Pooled	2011-12	2012-13	Pooled
<i>Fertilizer management</i>									
Ammonium sulphate; 200 kg/ha at emergence of <i>Orobache</i> with irrigation	90.05	88.53	89.29	47.25	37.16	42.21	27.53	27.02	27.27
Castor cake; 200 kg/ha at 3 rd week after transplanting	89.34	89.25	89.29	45.98	38.60	42.29	26.27	26.41	26.34
Neem cake; 200 kg/ha at 3 rd week after transplanting	88.04	87.32	87.68	47.48	40.53	44.00	26.81	27.06	26.94
Control	85.50	84.16	84.83	44.88	37.08	40.98	25.72	25.61	25.66
LSD (p=0.05)	NS	NS	NS	NS	NS	NS	NS	NS	1.06
<i>Weed management</i>									
Pendimethalin at 1.0 kg/ha at emergence of <i>Orobache</i> with irrigation	88.28	88.06	88.17	46.59	38.25	42.42	26.68	26.61	26.64
Isoproturon at 1.0 kg/ha at emergence of <i>Orobache</i> with irrigation	88.78	89.31	89.04	46.00	37.75	41.88	26.35	27.16	26.75
Glyphosate at 1.0 kg/ha at emergence of <i>Orobache</i> with irrigation	87.54	86.50	87.02	45.01	37.11	41.06	25.81	26.66	26.23
Manual weeding as and when required	87.61	84.49	86.05	50.16	42.98	46.57	29.51	28.33	28.92
Unweeded	88.94	88.21	88.57	44.23	35.63	39.93	24.56	23.85	24.21
LSD (p=0.05)	NS	NS	NS	3.68	3.33	2.45	1.69	1.71	1.19
Interaction <i>Fertilizer management</i> × <i>Weed management</i>									
	NS	NS	NS	NS	NS	NS	NS	NS	NS
C.V. %	9.63	9.13	4.69	11.19	12.27	5.85	9.00	9.11	4.53

Table 2. Yield and economics as influenced by different fertilizer and weed management treatments (average of two years)

Treatment	Yield (t/ha)		Gross return (x10 ³ /ha)	Total cost of cultivation (x10 ³ /ha)	Net return (x10 ³ /ha)	BCR
	Cured leaf	Stalk				
<i>Fertilizer management</i>						
Ammonium Sulphate; 200 kg/ha	2.22	1.77	66.14	33.56	32.59	1.97
Castor cake; 200 kg/ha	2.04	1.66	60.86	33.51	27.35	1.82
Neem cake; 200 kg/ha	2.07	1.72	61.71	35.19	26.51	1.75
Control	1.98	1.60	59.00	31.42	27.59	1.88
<i>Weed management</i>						
Manual weeding	2.23	1.72	66.63	35.37	31.26	1.88
Pendimethalin at 1.0 kg/ha	2.06	1.70	61.23	33.76	27.46	1.81
Isoproturon at 1.0 kg/ha	2.09	1.67	62.23	33.15	29.08	1.87
Glyphosate at 1.0 kg/ha	2.06	1.69	61.53	33.08	28.45	1.86
Unweeded	1.94	1.63	57.97	31.72	26.25	1.83

Sale price: (1) Year: 2011-12: Cured leaf: ` 24.15/kg; Stalk: ` 00.50/kg; (2) Year: 2012-13: Cured leaf: ` 35.25/kg; Stalk: ` 00.50/kg

and herbicide treatments was due to either low broomrape infestation or short broomrape competition period. The results are substantiated with the studies conducted by Dhanapal *et al.* (1998), Giridhar and Mahadevaswamy (2003), Kataria *et al.* (2003), Nadal *et al.* (2008), Anonymous (2009-10), Ramchandra Prasad (2011).

Interaction effect

The interaction effect was found non-significant in plant height, leaf length, leaf width, cured leaf yield and stalk yield during both the year 2011-12 and 2012-13.

Economics

Maximum net return of ` 32588/ha along with BCR value of 1.97 was recorded with ammonium sulphate 200 kg/ha followed by control with net return of ` 27586/ha and BCR value of 1.88. Similar results have been reported by Abu-Irmaileh (1981), Westwood and Foy (1999), Mariam and Suwanketnikom (2004).

Manual weeding was found superior with the highest net returns (` 31257/ha) and BCR (1.88) followed by isoproturon 1.0 kg/ha with net returns (` 29082/ha) and BCR of (1.87). The treatment unweeded control recorded lowest net return (` 26248/ha) and BCR (1.83) followed by Pendimethalin at 1.0 kg/ha with net return of ` 27465/ha and BCR of 1.81. The increase in profit was mainly due to more cured leaf yield of *bidi* tobacco. Similar results were found by Kataria *et al.* (2003), Anonymous (2009-10) and Ramchandra Prasad (2011).

It could be concluded that for securing maximum cured leaf yield of *bidi* tobacco as well as economic returns, ammonium sulphate at 200 kg/ha along with irrigation should be applied. Manual weeding of broomrape was found to be the best practice for weed control.

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