

EFFECT OF SPACING AND FERTILIZER LEVELS ON SEED YIELD OF *JATI* TOBACCO UNDER *TERAI* REGION OF WEST BENGAL

R.L. ARYA, V. KRISHNAMURTHY, K.D. SINGH, S. AMARNATH, S. ROY AND
C. CHANDRASEKHARARAO

Central Tobacco Research Institute Research Station, Dinhata - 736 135

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A field experiment was carried out for two consecutive seasons from 2005-06 and 2006-07 at CTRI Research Station, Dinhata to study the effect of spacing and N, P and K levels on seed yield, quality and economics of *Jati* tobacco grown under *Terai* region of West Bengal. Results revealed that significantly taller plants were observed in narrow spacings compared to wider spacings. The number of leaves, number of braches/plant, number of fertile and total capsules, weight of seeds/plant, green and cured leaf yields were significantly high at wider spacing (90 x 90 cm) than the other spacings during both the years. Decreasing plant to plant spacing significantly increased the seed yield of *Jati* tobacco var. *Manasi*. Tobacco seed equivalent yield was significantly increased with decrease in the level of spacing, i.e. 90 x 30 cm as compared to that of wider spacing (90 x 90 cm) during both the seasons. Significantly higher growth and yield attributes, cured leaf, seed and tobacco seed equivalent yield, net return and benefit: cost ratio and chemical composition of leaf were recorded with 150:100:100 kg NPK/ha than 100:50:50 kg NPK/ha.

INTRODUCTION

In North Bengal region, two distinct types of tobacco viz., *Motihari* (*Nicotiana rustica* L.) and *Jati* (*N. tabacum* L.) tobacco are grown in an area of approximately 1400 and 4000 ha, respectively. *Jati* tobacco varieties *Chama* (late maturing) and *Podali* (early maturing) were grown in and around Singimari river of Cooch Behar district. A high yielding new *Jati* tobacco variety "Manasi" was released for the benefit of farmers of North Bengal region. Besides cured leaf yield, the seed yield potential of newly released *Jati* tobacco variety *Manasi* is approximately 1000 kg/ha. Hence there is tremendous scope for alternative uses of *Jati* tobacco specially for tobacco seed oil. Tobacco

seed with its rich oil content and high quality seed cake, offers a vast scope to be exploited for its alternative uses (Deo Singh and Narasimha Rao, 2005; Lalitha Davi *et al.*, 2002; Thakur *et al.*, 1998 and Nagaraj, 1995). Present investigation was proposed to study the effect of plant population and fertilizer doses on seed yield, quality and economics of newly released *Jati* tobacco variety *Manasi*.

MATERIALS AND METHODS

A field trial was conducted for two consecutive seasons 2005-06 and 2006-07 at CTRI Research Station, Dinhata, Cooch Behar district (West Bengal) to study the effect of spacings and fertilizer levels on cured leaf yield, seed yield, quality and economics of *Jati* tobacco (var. *Manasi*) under *terai* region of North Bengal. The treatment combinations were five spacings viz., 90 x 90, 90 x 75, 90 x 60, 90 x 45 and 90 x 30 cm and three fertilizer levels viz., 100:50:50, 125:75:75 and 150:100:100 kg NPK/ha in factorial randomized block design with three replications. The soil of experimental field was sandy loam, acidic (pH: 4.8), low in organic matter (0.41%) and medium in available phosphorus (24.3 kg/ha) and potassium (171.5 kg/ha). Healthy seedlings of 50-55 days old were transplanted in the first week of November in the respective years of study. All package of practices were followed in raising the crop.

RESULTS AND DISCUSSION

Significantly higher plant height was recorded in narrow intra-row spacing as compared to wider spacings (Table 1). The number of leaves and branches/plant significantly increased in wider

spacing i.e. 90 x 90 cm than in other spacings. Spacings of 90 x 75, 90 x 60 and 90 x 45 cm also recorded significantly higher number of leaves and number of branches/plant than 90 x 30 cm. Application of 150:100:100 kg NPK/ha recorded significantly taller plants, more number of leaves and branches/plant as compared to those of 100:50:50 kg NPK/ha.

Significantly more number of fertile and total number of capsules and seed weight/plant was recorded at 90 x 90 cm compared to that of other spacings (Table 1). Spacings of 90 x 75, 90 x 60 and 90 x 45 cm recorded significantly more number of fertile and total number of capsules as well as higher seed weight per plant as compared to 90 x 30 cm spacing. Similarly, the number of non-fertile capsules decreased significantly with increase in spacings. Application of 150:100:100 kg NPK/ha produced significantly higher number of fertile and total number of capsules and seed weight/plant than 100:50:50 kg NPK/ha.

Significantly highest green and cured leaf yield of *Jati* tobacco was recorded at wider row spacing i.e. 90 x 90 cm than at narrow row spacings during 2005-06 and 2006-07 (Table 2). Decrease in intra-row spacing significantly

increased the seed yield of *Jati* tobacco var. Manasi. Significantly highest seed yield was obtained at 90 x 30 cm than 90 x 90 cm spacing during 2005-06 and 2006-07. Narrow spacing of 90 x 30 cm recorded significantly higher tobacco seed equivalent yield than wider row spacings. The increase in tobacco seed and tobacco seed equivalent yield was 31.3 and 21.4 % at 90 x 30 cm compared to 90 x 60 cm, respectively. Application of 150:100:100 kg NPK/ha produced significantly higher green leaf, cured leaf, seed and tobacco seed equivalent yield compared to 100:50:50kg NPK/ha, respectively during 2005-06 and 2006-07. The increase in seed and tobacco seed equivalent yield was 18 and 18.4%, respectively at 150:100:100 kg NPK/ha than 100:50:50 kg NPK/ha, respectively. Patel *et al.* (1998) reported that dense plant population produced 1171 kg/ha seed having an oil yield of about 132 kg/ha.

Maximum net returns were recorded at 90 x 30 cm spacing followed by 90 x 60, 90 x 45 and 90 x 75 cm spacings (Table 3). Maximum benefit: cost ratio was recorded at 90 x 60 cm row spacing. Minimum gross and net returns and benefit: cost ratio were obtained at 90 x 90 cm. Application of

Table 1: Growth and yield attributing parameters of *Jati* tobacco as influenced by spacing and fertilizer levels (pooled data)

| Treatment | Plant height (cm) | No. of leaves/plant | No. of branches/plant | No. of capsules fertile | No. of capsules non-fertile | Total | Seed weight/plant (g) |
|-------------------------------------|-------------------|---------------------|-----------------------|-------------------------|-----------------------------|-------------|-----------------------|
| Spacing (cm) | | | | | | | |
| 90 x 90 | 168 | 29.1 | 8.2 | 564 | 20.6 | 584 | 96.8 |
| 90 x 75 | 173 | 27.5 | 7.8 | 471 | 22.8 | 494 | 86.7 |
| 90 x 60 | 174 | 25.2 | 7.3 | 414 | 24.6 | 439 | 81.3 |
| 90 x 45 | 178 | 23.6 | 7.0 | 385 | 26.5 | 412 | 67.8 |
| 90 x 30 | 181 | 21.5 | 6.2 | 330 | 30.8 | 361 | 61.6 |
| SEm± | 1.5 | 0.5 | 0.2 | 10.9 | 1.0 | 11.4 | 1.5 |
| CD (P=0.05) | 4.3 | 1.5 | 0.5 | 31.7 | 2.9 | 32.9 | 4.4 |
| Fertility levels (kg NPK/ha) | | | | | | | |
| 100:50:50 | 172 | 23.9 | 6.9 | 399 | 26.0 | 425 | 68.1 |
| 125:75:75 | 175 | 25.2 | 7.3 | 436 | 25.1 | 461 | 79.6 |
| 150:100:100 | 179 | 26.9 | 7.7 | 464 | 24.1 | 488 | 88.7 |
| SEm± | 1.1 | 0.4 | 0.1 | 8.5 | 0.8 | 9.2 | 1.2 |
| CD (P=0.05) | 3.1 | 1.2 | 0.4 | 24.5 | 2.3 | 26.5 | 3.4 |

Table 2: Leaf and seed yield (kg/ha) of Jati tobacco as influenced by spacings and fertilizer levels

| Treatment | Green leaf yield | | | Cured leaf yield | | | Seed yield | | | Tobacco seed equivalent | | |
|--------------------------------------|------------------|------------|------------|------------------|-----------|-----------|------------|-----------|-----------|-------------------------|-----------|------------|
| | 2005-06 | 2006-07 | Pooled | 2005-06 | 2006-07 | Pooled | 2005-06 | 2006-07 | Pooled | 2005-06 | 2006-07 | Pooled |
| Spacing (cm) | | | | | | | | | | | | |
| 90 x 90 | 5357 | 6189 | 5773 | 603 | 762 | 683 | 918 | 967 | 943 | 1101 | 1423 | 1262 |
| 90 x 75 | 4835 | 6166 | 5501 | 559 | 760 | 659 | 1097 | 1021 | 1059 | 1299 | 1478 | 1389 |
| 90 x 60 | 4335 | 5288 | 4835 | 534 | 627 | 580 | 1196 | 1086 | 1141 | 1410 | 1463 | 1436 |
| 90 x 45 | 4146 | 4575 | 4360 | 505 | 578 | 542 | 1228 | 1105 | 1167 | 1452 | 1452 | 1452 |
| 90 x 30 | 3676 | 4023 | 3849 | 456 | 578 | 517 | 1294 | 1182 | 1238 | 1535 | 1529 | 1532 |
| SEm± | 104 | 253 | 178 | 17 | 31 | 24 | 33 | 25 | 29 | 90 | 31 | 60 |
| CD (P=0.05) | 301 | 733 | 515 | 49 | 90 | 69 | 95 | 74 | 84 | 260 | 91 | 174 |
| Fertilizer levels (kg NPK/ha) | | | | | | | | | | | | |
| 100:50:50 | 3946 | 4683 | 4315 | 481 | 597 | 539 | 1051 | 991 | 1021 | 1243 | 1349 | 1296 |
| 125:75:75 | 4494 | 5475 | 4984 | 526 | 674 | 600 | 1125 | 1082 | 1103 | 1335 | 1486 | 1411 |
| 150:100:100 | 4994 | 5584 | 5291 | 587 | 712 | 649 | 1264 | 1144 | 1204 | 1499 | 1572 | 1535 |
| SEm± | 81 | 196 | 138 | 13 | 24 | 18 | 25 | 20 | 22 | 69 | 24 | 47 |
| CD (P=0.05) | 233 | 570 | 199 | 38 | 70 | 53 | 74 | 40 | 65 | 201 | 70 | 135 |

150:100:100 kg NPK/ha recorded maximum gross net returns and B:C ratio followed by 125:75:75 kg NPK/ha and 100:50:50 NPK/ha. Highest benefit: cost ratio was obtained in 150:100:100 kg NPK/ha followed by 125:75:75 and 100:50:50 kg NPK/ha.

Significantly highest nicotine, P and K content in cured leaf was recorded in wider row spacing as compared to narrow spacing (Table 4). The

chloride content was highest at narrow row spacing than at wider spacing. Application of 150:100:100 kg NPK/ha produced significantly higher nicotine (1.55%), P (0.39%), K (2.37%) and chloride content (0.60%).

From the study it can be concluded that narrow spacing of 90 x 30 cm and a fertilizer dose of 150:100:100 is suitable for production of higher seed yield, net returns and benefit : cost ratio.

Table 3: Economics of Jati tobacco for seed production as influenced by spacings and fertilizer levels

| Treatments | Gross return (Rs/ha) | | | Net return (Rs/ha) | | | Benefit : cost ratio | | |
|---------------------------------------|----------------------|---------|-------|--------------------|---------|-------|----------------------|---------|------|
| | 2005-06 | 2006-07 | Mean | 2005-06 | 2006-07 | Mean | 2005-06 | 2006-07 | Mean |
| Spacing (cm) | | | | | | | | | |
| 90 x 90 | 27521 | 35574 | 31548 | 7683 | 13974 | 10829 | 1.39 | 1.65 | 1.52 |
| 90 x 75 | 32483 | 36949 | 34716 | 12398 | 15102 | 13750 | 1.69 | 1.69 | 1.66 |
| 90 x 60 | 35244 | 36565 | 35905 | 14789 | 14348 | 14569 | 1.72 | 1.65 | 1.69 |
| 90 x 45 | 36293 | 36309 | 36301 | 15221 | 13475 | 14348 | 1.72 | 1.59 | 1.66 |
| 90 x 30 | 38375 | 38224 | 38300 | 16089 | 14159 | 15124 | 1.72 | 1.59 | 1.66 |
| Fertilizer levels (NPK kg /ha) | | | | | | | | | |
| 100:50:50 | 31086 | 33726 | 32406 | 11922 | 12800 | 12361 | 1.62 | 1.61 | 1.62 |
| 125:75:75 | 33387 | 371158 | 35273 | 12636 | 14645 | 13641 | 1.61 | 1.65 | 1.63 |
| 150:100:100 | 37477 | 39285 | 38381 | 15150 | 15190 | 15170 | 1.60 | 1.63 | 1.66 |

Sale price: Rs 25 /kg of tobacco seed
Rs 10 per kg of 3rd grade tobacco leaf

Table 4: Nutrient composition of tobacco leaf as influenced by different treatments (%)

| Treatment | Nicotine | P | K | Chlorides |
|--------------------------------------|--------------|--------------|--------------|--------------|
| Spacing (cm) | | | | |
| 90 x 90 | 1.54 | 0.39 | 2.35 | 0.41 |
| 90 x 75 | 1.43 | 0.37 | 2.20 | 0.46 |
| 90 x 60 | 1.42 | 0.36 | 2.20 | 0.48 |
| 90 x 45 | 1.33 | 0.35 | 2.13 | 0.51 |
| 90 x 30 | 1.30 | 0.35 | 2.11 | 0.53 |
| SEm± | 0.034 | 0.009 | 0.033 | 0.015 |
| CD (P=0.05) | 0.099 | 0.026 | 0.096 | 0.042 |
| Fertilizer levels (NPK Kg/ha) | | | | |
| 100:50:50 | 1.32 | 0.34 | 2.13 | 0.34 |
| 125:75:75 | 1.34 | 0.37 | 2.18 | 0.49 |
| 150:100:100 | 1.55 | 0.39 | 2.27 | 0.60 |
| SEm± | 0.026 | 0.007 | 0.026 | 0.011 |
| CD (P=0.05) | 0.007 | 0.020 | 0.074 | 0.033 |

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