EFFECT OF NITROGEN ON THE GROWTH AND YIELD OF SESAME - A REVIEW

P. Kalaiselvan, K. Subrahmaniyan and T.N. Balasubramanian
Regional Research Station,
Tamil Nadu Agricultural University, Vridhachalam - 606 001, India

ABSTRACT

Sesame is highly a fertilizer responsive crop especially to nitrogen. Even then farmers seldom apply inorganic fertilizers. Adequate application of nitrogenous fertilizers not only improves the crop yield but also maintains soil N status and thus sustain productivity. Various reports indicate that in sesame, application of N fertilizers results in significant increase in growth and yield parameters and seed yield. The response of sesame to N fertilizers varied from 20-150 kg ha$^{-1}$ under different micro farming situations. Each successive increase in N level upto 150 kg ha$^{-1}$ increased the various growth parameters viz., plant height, number of branches and dry matter production. Similarly yield components and yield were significantly increased upto 150 kg N/ha.

Sesame (Sesamum indicum L.) is an ancient oilseed crop grown in India which is the largest producer of this crop in the world. This crop is raised over an area of about 1.67 m. ha per annum with annual production of 0.6 m.t. Though India is the largest producer of sesame in the world, the productivity is only 250 kg/ha (Anonymous 1999-'00). Among various factors responsible for the low productivity levels of sesame, lack of fertilizer application is the most important one. Pariacha et al. (1988) pointed out that sesame seed production could be raised by 50 per cent by way of proper fertilization alone. In order to maximize the production and quality of oilseed crops like sesame, it has become necessary to look for other alternative strategies of production technology, mainly the adoption of proper fertilization. (Devasagayam and Jayapaul, 1997). In order to increase the productivity of sesame through proper application of N fertilizers, the earlier literature on these lines has to be reviewed properly.

Effect of nitrogen on growth parameters: Rehman et al. (1980) observed increased plant height and number of effective capsules plant$^{-1}$ with N application. Kamel et al. (1983) observed that there was higher crop growth rate under 72 kg N ha$^{-1}$. Majumdar et al. (1987) observed increased plant height with an increase in N level. Rao et al. (1990) reported that application of N at 20 kg ha$^{-1}$ to sesame resulted in significant increase in plant height. Similar effect was also reported by Gaur and Tomor (1978). Positive effect of N on dry matter production was reported by Samui et al. (1990). Sinharoy et al. (1990) found that application of 30 and 60 kg N ha$^{-1}$ increased the plant height and number of branches plant$^{-1}$. Mandal et al. (1992) reported that plant height and dry matter of sesame had increased significantly with increase in the level of N. They found that the DMP was maximum with 90 kg N ha$^{-1}$ at 40, 65 and 90 DAS. They further observed that maximum crop growth rate was with the application of 67 kg N ha$^{-1}$. Application of higher doses of nitrogen significantly increased the plant height, dry matter production and stalk weight (Balasubramanian et al., 1995). Ramanathan and Chandrasekaran (1998) reported that increasing level of N up to 100 kg ha$^{-1}$ significantly increased the number of branches, capsules plant$^{-1}$ and grains capsules$^{-1}$.

Effect of nitrogen on yield components and yield: Arroyo (1967) reported that sesame had high productivity potential but the yield hardly exceeded 180 kg ha$^{-1}$ in India while in Venezuela it was as high as 1960 kg ha$^{-1}$ even with a low dosage of 12 kg N ha$^{-1}$. This
was sufficient for sandy savannah soil of Venezuela. Rai and Srivastava (1968) observed that N and P but not K were helpful in effecting yield response in sesame. They considered that 22.5 kg N ha\(^{-1}\) was optimum and was also economical.

Kumar and Upadhyaya (1969) stated that 15 kg N ha\(^{-1}\) was sufficient under Rajasthan condition and 50 kg N ha\(^{-1}\) was for irrigated sesame in Gujarat while not more than 34 kg N ha\(^{-1}\) for Haryana and Punjab. Gopalkrishnan et al. (1971) reported that application of fertilizer especially, N and P increase the yield of sesame in Tamil Nadu under summer irrigated condition. They considered that 22.5 kg N ha\(^{-1}\) was optimum and also economical.

Bhan and Singh (1973) studied the fertilizer requirement of sesame in Uttar Pradesh during kharif season. The optimal requirement of N was 30 kg ha\(^{-1}\). Significant increase in yield was obtained for 20 kg N ha\(^{-1}\). In another study by Gaur and Trehan (1973), sesame responded to maximum dosage of 30 kg N ha\(^{-1}\). Any increase in fertilizer dose beyond 30 kg N ha\(^{-1}\) tended to depress the yield. Arunachalam (1976) reported that at higher level of 60 kg N ha\(^{-1}\) there was a greater depression in yield of sesame. In a study on repose to N application at Coimbatore during monsoon and summer seasons, the results indicated that the response to N was quadratic in summer and linear in monsoon crop. In both the season there was response to N upto 30 kg N ha\(^{-1}\) (Subaramanian and Sankaran, 1978).

Daulay and Singh (1982) obtained increased seed yield in sesame upto 20 kg N ha\(^{-1}\). Ananda Rao et al. (1984) reported that increasing level of nitrogen increased the number of capsules, test weight and yield. Metwally et al. (1984) reported that seed yield of sesame increased with the increasing N level. Prakash and Thimme Gowda (1989) found that increasing N from 0 to 60 kg ha\(^{-1}\) increased seed yield from 397 to 609 kg ha\(^{-1}\). Singh and Sahu (1986) confirmed that application of 40 to 50 kg N ha\(^{-1}\) was necessary for optimal yields in coarse textured soil. In Sudan, Osman (1986) and reported that local cultivars of sesame did not respond to applied nitrogen.

Application of 17 kg N ha\(^{-1}\) found to be economic rate for laterite sandy soil of West Bengal (Majumdar et al. 1988). Studies conducted at Jalgaon revealed that entry Tapi, responded upto 50 kg N ha\(^{-1}\) and registered a seed yield of 872 kg ha\(^{-1}\) gave the highest yield of 576 kg ha\(^{-1}\) (AICORPO, 1988). Experiments conducted at Mandore indicated that 40 kg N ha\(^{-1}\) significantly registered higher seed yield (AICORPO, 1988).

Kadam (1989) observed increased seed yield with increase in N level. Deshmukh et al. (1990) and Rao et al. (1990) reported that the seed yield increased with increased level of N application. Sinharoy et al. (1990) found that application of 30 and 60 kg ha\(^{-1}\) gave an average seed yield of 651 and 801 kg ha\(^{-1}\). Similarly Jadhav et al. (1992) observed that seed yield increased upto 120 kg N ha\(^{-1}\).

Gnanamura thy et al. (1992) reported increased seed yield in TMV 3 sesame upto 20 kg N ha\(^{-1}\). While, Tomar et al. (1992) found that response to nitrogen had been obtained upto 60 kg N ha\(^{-1}\) which had given more reproductive growth and satisfactory yield. Similarly, Prakash and Thime Gowda (1992) also recorded increased seed yield by 53 per cent with increased N rate from 0.40 t ha\(^{-1}\) (0 kg N ha\(^{-1}\)) to 0.61 t ha\(^{-1}\) (60 kg N ha\(^{-1}\)) due to enhanced value of yield attributes viz., capsules plant \(^{-1}\) and seeds capsule \(^{-1}\).

Shrivastava and Tripathi (1992) also observed significantly higher yield and yield attributes due to the application of 90 kg N ha\(^{-1}\) except capsules branch \(^{-1}\). Increased seed yield with increase in N rate had been reported (Shrivastava and Tripathi, 1992; Sarma and Kakati, 1993). Kumar and Prasad (1993) re-
reported that the seed yield increased with N fertilizer rate from 0.13 t ha⁻¹ without N to 0.22 to t ha⁻¹ with 90 kg N ha⁻¹.

Chandrarakar et al. (1994) found higher dose of 150 kg N ha⁻¹ resulted in split application on 45, 25 and 75 per cent higher yield compared with that of 0, 50 and 100 kg N ha⁻¹ respectively under irrigated condition. But Sarma (1994) in two years of study noted that seed yield increased with rate of N application in one year but not in the another years.

Application of 60 kg N ha⁻¹ gave significantly increased grain yield during 1992-93 where as application of 90 kg N ha⁻¹ gave significantly higher yield and at par with 60 kg N ha⁻¹ during 1994 at Vridhachalam.

In another study at the same location, 60 kg N ha⁻¹ gave significantly higher yield (702 kg ha⁻¹) as compared to 30 kg N ha⁻¹ (671 kg ha⁻¹) and no nitrogen (642 kg ha⁻¹). But at Nagpur, application of 40 kg N ha⁻¹ gave significantly higher yield of 406 kg ha⁻¹ as compared to 55 kg N ha⁻¹ (388 kg ha⁻¹) and 25 kg N ha⁻¹ (389 kg ha⁻¹). Whereas in Jalgaon it was reported that higher yield of 1453 kg ha⁻¹ was noted under 50 kg N ha⁻¹ (Annon., 1995-96).

Increasing levels of N application gave better effect on the growth and yield parameters as well as sesame yield (804 kg ha⁻¹) upto 60 kg N ha⁻¹ (Balasubramanian et al., 1995). Application of N upto 60 kg ha⁻¹ significantly increased sesame yield (Balasubramanian and Dharmalingam, 1996). Ramanathan and Chandrasekaran (1998) reported that increasing level of N up to 100 kg ha⁻¹ significantly increased the seed yield (811 kg ha⁻¹). Application of 55-kg N ha⁻¹ recorded significantly higher seed yield (839 kg ha⁻¹) over lower levels of N (Subrahmanian and Arulmozhi, 1999).

**Effect of N on nutrient uptake and oil content:** Mitchell et al. (1974) observed that the oil and protein contents of sesame seed progressively increased with increasing N levels. Rao (1992) observed that increased N fertilizer had increased plant N concentration but decreased P and K concentrations, while increased seed and straw P concentrations but did not generally affect N or K. Kumar and Prasad (1993) found that the seed oil concentration was highest (47 per cent) with 30 kg N ha⁻¹. Sinharoy et al. (1990) reported that application of 30 and 60 kg N ha⁻¹ increased the seed oil content from 39.84% to 41.71% and 42.92%, respectively.

**REFERENCES.**


