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Effect of fertility levels on sesame (*Sesamum indicum*) varieties under agri-horti system

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Sesame (*Sesamum indicum* L.) is an important edible oilseed crop grown in India. India ranks first, both in area and production of sesame in the world (IOPEPC *kharif*-2017). But, the productivity of sesame in Uttar Pradesh is almost half of national productivity. The reason behind it is that here sesame is grown mostly during rainy (*kharif)* season under the rainfed condition on marginal and sub-marginal land without the use of proper fertilizers. In all crops, different varieties exist with specific characteristics. The benefits of agroforestry add up to a substantial improvement of the economy and resource sustainability of agriculture. Among the alternatives developed by the land use system, the dryland-horticulture and agri-horticulture system (fruit-based agroforestry system) are readily selected by farmers because of the cash benefits derived from this system. As the crops are grown on agri-horti system under rainfed conditions, the problem of shading, nutrients availability and moisture stress arose which affects the growth and yield of sesame crop. Nitrogen, phosphorus, potassium and sulphur have an intense effect on crop productivity and quality. Their adequate supply during growth period improves the water relations of plant and photosynthesis, synthesizes the protein, imparting resistance against the pest attack and diseases. Besides this, varietal selection can also improve productivity of crops in agri-horti system. Keeping this information into consideration, the present investigation was conducted to find out the effect of NPK and S levels on growth, yield and quality of sesame varieties under custard apple based agri-horti system.

A field experiment was conducted during rainy (*kharif*) season of 2018–19 at the Rajiv Gandhi South Campus Agricultural Research Farm, Barkachha (BHU) Mirzapur, located in the Vindhyan district of Mirzapur, Uttar Pradesh (25°10" latitude, 82°37" longitude and 427 m amsl). The soil (0–20 cm) of the experimental field was sandy clay loam in texture. The experimental soil was low in available nitrogen (153.32 kg/ha), medium in phosphorus (14.15 kg/ha), medium in potassium (217.58 kg/ha) and low in sulphur (12.14 kg/ha).The experiment was laid out in 11 years old custard apple planted at a spacing of 5 m × 5 m. Sesame was sown as intercrop. The experiment was conducted in split-plot design having three levels of NPK and S (F_1, 20 kg/ha N + 10 kg/ha P_2O_5 + 10 kg/ha K_2O + 10 kg/ha S; F_2, 40 kg/ha N + 20 kg/ha P_2O_5 + 20 kg/ha K_2O + 20 kg/ha S; F_3, 60 kg/ha N + 30 kg/ha P_2O_5 + 30 kg/ha K_2O + 30 kg/ha S) with 3 varieties of sesame (V_1- Type-4, V_2- Shekhar, V_3-RT-346) with 3 replications. The experiment consists of a total of 9 treatment combinations. The gross and net plot size of experimental unit was 4 m × 3.6 m and 3 m × 3 m respectively. The distance between two rows was 30 cm. Plant spacing within the row was 10 cm. Observations of growth parameters were recorded at an interval of 20 days, i.e. 30, 50, 70 days after sowing and at maturity. Similarly, yield attributing characters were also recorded during harvesting period. After harvesting, sesame seed and stover samples were processed and analysed for quality parameters such as protein content, oil content, nutrient uptake i.e. N (Colorimetric method), P (Vanado molybdate yellow colour method), K (Flame-Photometric method) and S (Turbid metric method). The oil content was estimated by Soxhlet apparatus method following the procedure of Singh *et al*. (1960). Data obtained from various observations were analysed statistically by adopting the appropriate Analysis of Variance method (Gomez and Gomez 1976).

Result revealed that growth parameters increased rapidly between 50 and 70 DAS indicating that, this period is the active vegetative growth period of sesame (Table 1). However, the increment was relatively slow at maturity. Increasing levels of NPKS application up to 60, 30, 30, 30 kg N, P_2O_5, K_2O and S/ha recorded significantly maximum green leaves/plant, number of primary branch/plant and dry matter accumulation/plant in sesame variety 'Shekhar' followed by RT-346 and Type-4 throughout the crop growth period (Jat *et al.* 2014 and Ahmad *et al*. 2018). This varietal difference may be attributed to the genetic character and

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makeup of the varieties used in the experiment. These results are in agreement with the findings of Nahar *et al.* (2008) and Rajiv *et al.* (2012). Data shows that (Table 1), yield attributing characters, viz. number of capsule/plant, number of seed/capsule, length of capsule, test weight, seed yield were significantly higher in sesame variety Shekhar with increasing levels of NPKS application at the rate of 60, 30, 30, 30 kg and 40, 20, 20, 20 kg N, P_2O_5, K_2O, S/ha over 20, 10, 10, 10 kg N, P_2O_5, K_2O, S/ha followed by RT-346 and lowest in the variety Type-4. Similar findings concerning the varietal differences for various yield attributes have also been reported by Rajiv *et al*. (2012) and Jadhav *et al*. (2010). The greater availability of NPKS at higher fertility levels is likely to induce greater translocation of photosynthesis from leaves via stem to sink i.e. capsule and seed. This resulted in a higher length of a capsule and more number of seeds which on maturity became bold with higher test weight and seed yield. Similar results have also been published by Jat *et al*. (2017) and Umata *et al.* (2017) in sesame.

The viability of any practice is evolved on the basis of experimentation and depends upon its economic feasibility. The best treatment, if not fetching appropriate monetary returns, may not be acceptable to farmers. Present study revealed that along with three sesame variety, Shekhar registered highest gross returns (₹63,327/ha), net returns (₹30,061/ha) and higher Benefit-cost (B:C) ratio (1.95) over rest of varieties under the custard apple agri-horti system (Table 2).These results were confirmed with the findings of Tiwari *et al*. (2000) and Shah *et al.* (2013). Similarly, fertility levels indicated significant effect on net income and B:C ratio. Highest net income and B:C ratio was found with higher fertility level i.e. 60 kg N, 30 kg P_2O_5, 30 kg K_2O, and 30 kg S/ha. This could be attributed due to the enhanced economic yield with each increment of NPKS level. Singh *et al*. (2012) and Patel *et al*. (2013) also noticed similar results in the experiment.

Table 2 Economics of sesame as influenced by NPKS levels on sesame variety

Treatment	Gross return/ha (₹)	Net return/ ha (₹)	B:C ratio
Fertility levels (F) *(N, P_2O_5, K_2O, S kg/ha)*			
20 ,10, 10, 10	50325	19200	1.62
40, 20, 20, 20	59986	26805	1.81
60, 30, 30, 30	66858	31622	1.94
SEm±	1841	1841	0.06
CD (P=0.05)	7227	7227	0.24
Variety (V)			
Type-4	54492	21397	1.64
Shekhar	63327	30061	1.95
RT-346	59350	26169	1.78
SEm±	1853	1853	0.06
CD (P= 0.05)	5708	5708	0.17

SUMMARY

The move towards higher production of quality crops with alternative land use systems i.e. agri-horticulture system in combination with adequate supply of nitrogen, phosphorus, potassium and sulphur and improved varietal selection can solve the problem of lower productivity. Consequently, the present study illustrated that selection of crop varieties according to land use system with balanced nutrients supply can optimize the crop production in sustainable manner. The study showed that the performance of crop with different varietal selection was influenced by the different levels of nutrients supply. The growth and yield parameters were significantly affected with the application of 60, 30, 30, 30 kg of N, P_2O_5, K_2O and S/ha and produced significantly higher seed yield (675 kg/ha)

Table 1 Effect of varieties and fertility levels on growth, yield parameter and seed yield of sesame varieties

Treatment	Primary branch/ plant	Number of leaves/ plant	Dry matter accumulation/ plant (g)	No. of capsule/ plant	No. of seed/ capsule	Test weight (g) (1000-seed)	Seed yield
Fertility levels (F) *(N, P_2O_5, K_2O, S kg/ha)*							
20, 10, 10, 10	8.4	13.26	8.23	25.41	48.61	2.33	511
40, 20, 20, 20	9.2	14.53	8.86	28.52	51.6	2.38	604
60, 30, 30, 30	10.37	14.67	9.23	33.63	57.77	2.68	675
SEm±	0.24	0.27	0.19	0.55	1.7	0.07	20
CD (P=0.05)	0.96	1.06	0.73	2.18	6.69	0.28	79
Variety (V)							
Type-4	9.06	13.14	8.32	28.43	50.26	2.3	553
Shekhar	9.68	15	9.21	30.39	55.38	2.66	637
RT-346	9.23	14.33	8.78	28.74	52.35	2.43	600
SEm±	0.14	0.35	0.2	0.5	0.96	0.06	20
CD (P=0.05)	0.42	1.07	0.62	1.53	2.96	0.19	61

as compared to 40, 20, 20, 20 kg of N, P_2O_5, K_2O and S/ha and 20, 10, 10, 10 kg of N, P_2O_5, K_2O, and S/ha among various fertility levels.

REFERENCES

Ahmad J, Ahmad F, Iqbal S, Shah S M A, Ali M, Abbas M W, Nawaz H, Mehmood Z, Ali B and Ali S. 2018. Growth and oil yield of sesame as influenced by sulphur and nitrogen. *Open Access journal of agricultural research* **3**(7): 2474–8846.

Choudhary A A, Nikam R R and Patil S S. 2016. Effect of phosphorus and sulphur on oil, nutrient uptake and yield of linseed. *International Journal of Life Sciences* **6**: 33–36.

Indian Oilseed and Produce Export Promotion Council *Kharif*-2017 survey of sesame crop, Ministry of Commerce, Govt. Of India, 78–79, Bajaj Bhawan, Mumbai.

Jadav O P, Padamani D R, Polara K B, Parmar K B and Babaria N B. 2010. Effect of different level of sulphur and potassium on growth, yield and yield attributes of sesame (*Sesamum indicum* L.). *Asian Journal of Soil Science* **5**(1): 106–08.

Jahun H A, Sani M S, Maigatari A A, Aujara Y I, Siraja A and Lawan M. 2018. Effect of phosphorus and sulphur on oil content of Sesame (*Sesemum indicum* L.) varieties in Sudan Savannah Region of Nigeria. *Scholarly Journal of Agricultural Science* **8**(1): 7–10

Jat L, Yadav S S, Dhayal B C, Yadav G, Choudhary K M and Bera M. 2017. Effect of sulphur fertilization and varieties on sulphur use efficiency, yield attributes and yield of sesame. *Journal of Pharmacognosy and Phytochemistry* **6**(4): 717–20.

Mamatha K, Sagar G C V, Narayana P L and Padmaja G. 2017. Physiological growth, quality and economics of sesame (*Sesamum indicum* L.) as influenced by application of sulphur with use of farmyard manure. *International Journal of Chemical Studies* **5**(4): 2121–25.

Mondal S. 2016. Efficiency of sulphur source on sesame (*Sesamum indicum* L.) in red and lateritic soil of west Bengal. *International Journal of Plant, Animal and Environmental Sciences* **6**(2): 2231–90.

Nahar Z, Mistry K K, Saha A K and Khaliq Q A. 2008. Response of nitrogen levels on yield of sesame (*Sesamum indicum* L.). *SAARC Journal of Agriculture* **6**(1): 1–7.

Paul S K, Khatun M M and Sarkar Md A R. 2019. Effect of sulphur on the seed yield and oil content of sesame (*Sesamum indicum* L.). *Journal of Bangladesh Agricultural University* **17**(1): 33–38.

Shah M A, Manaf A, Hussain M, Farooq S and Zafar-ul-Hye M. 2013. Sulphur fertilization improves the sesame productivity and economic returns under rainfed conditions. *International Journal of Agriculture and Biology* **15**(6): 1301–06.

Singh D P and Prakash H G. 2012. Response of sesame (*Sesamum indicum* L.) varieties to sulphur and potassium application under rainfed condition. *International Journal of Agricultural Sciences* **8**(2): 476–478.

Tiwari R K, Namdeo K N and Girish J. 2000. Effect of nitrogen and sulphur on growth, yield and quality of sesame (*Sesamum indicum* L.) varieties. *Research on Crops* **1**(2): 163–67.

Umata H B and Dabalo A H. 2017. Effect of fertilizer rate on the yield and yield component of sesame (*Sesamum indicum*) in moisture stress of Eastern Harerghe Zone. *Agricultural Research & Technology: Open Access Journal* **8**(3): 555738.