



## Effect of Seed Pelleting and Foliar Nutrition on Growth and Yield of Summer Irrigated Sesame (*Sesamum indicum* L.)

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Field experiment was conducted during 2017, to investigate the effect of seed pelleting and foliar nutrition on yield and productivity of summer irrigated sesame (*Sesamum indicum* L.). The experiment was laid out in factorial randomized block design with three replications. The two factors were seed pelleting and foliar nutrition. Pelleted and non pelleted seeds were the two levels of seed pelleting. Foliar nutrition comprised of Urea (1%), DAP (1%), 19:19:19 (NPK) (1%),  $MnSO_4$  (0.5%), MAP (0.5%), Combined nutrient spray (2%), Salicylic acid (100 ppm) and Control (no spray), which were sprayed at 30 and 45 DAS. Significantly higher plant height (113.8 cm), DMP (3182 kg.ha<sup>-1</sup>), number of branches (7.7), number of capsules per plant (143.4), seeds per capsule (52.1), thousand seed weight (2.90 g) and seed yield (659 kg.ha<sup>-1</sup>) were recorded by pelleted seeds. Among the foliar nutrients, combined nutrient formulation sprayed at 30 and 45 DAS recorded maximum plant height (127.4 cm) DMP (3856 kg.ha<sup>-1</sup>), number of branches (9.8), number of capsules per plant (153.2), seeds per capsule (58.4), thousand seed weight (3.12 g) and seed yield (719 kg.ha<sup>-1</sup>) in sesame.

**Key words:** Sesame, Seed pelleting, Foliar nutrition

Sesame (*Sesamum indicum* L.) is the oldest oilseed crop known and cultivated by the human beings. Its oil is well known for its diversified uses and is regarded as the 'Queen of Oilseeds'. India is the world leader in terms of area and production of sesame. But the average yield of sesame in India is far less than the world average. Lack of high yielding varieties, poor stand establishment and poor fertilizer response are the major constraints in the cultivation of sesame. Its yield may be increased by means of numerous improved technologies and practices such as use of high yielding varieties, seed treatment and through proper and balanced supply of nutrients.

One of the most promising techniques that can be adopted in direct sown small seeded crops like sesame is seed pelleting, which modifies the micro environment of the seed in favour of the seed. It provides macro and micronutrients essential for seedling establishment and protects the plants from pest and diseases during the early stages of its growth (Kamraj *et al.*, 2017).

Cultivation of sesame faces certain physiological constraints like heavy flower drop, slow dry matter accumulation and poor partitioning of assimilates from source to sink. These problems can be overcome by foliar application of plant growth regulators and nutrients essential for plant growth and development. Foliar application of macro and micro nutrients at critical stages of crop growth facilitates for quick supply of nutrients, thereby promoting photosynthesis and mobilization of assimilates to sink and ultimately the yield (Sharma *et al.*, 2013).

Hence the experiment was conducted with the objective to find out the effect of seed pelleting and foliar nutrition on growth and yield of summer irrigated sesame.

### Material and Methods

Field experiment was conducted at Tamil Nadu Agricultural University, Coimbatore during summer 2017 to investigate the effect of seed pelleting and foliar nutrition on yield and productivity of summer irrigated sesame. The soil of the field was sandy clay loam with a pH of 8.56 and electrical conductivity of 0.91 dSm<sup>-1</sup>. The experiment was laid out in factorial randomized block design with three replications. Sesame variety VRI 2 was used in this experiment. The performance of pelleted ( $P_1$ ) and non pelleted ( $P_0$ ) seeds and foliar nutrition with Urea @ 1% ( $T_1$ ), DAP @ 1% ( $T_2$ ), 19:19:19 (NPK) @ 1% ( $T_3$ ),  $MnSO_4$  @ 0.5% ( $T_4$ ), MAP @ 0.5% ( $T_5$ ), Combined nutrient spray @ 2% ( $T_6$ ), Salicylic acid @ 100 ppm ( $T_7$ ) and control (no spray) ( $T_8$ ) were evaluated. Foliar spraying was done at 30 and 45 days after sowing. Amount of nutrient sources required for each treatment was calculated based on the spray concentration. Spraying was done at early morning using a knapsack sprayer. Spray fluid was used at the rate of 500 litres per hectare.

Seed pelleting was done using a polymer coating, followed by a coating with Imidachloprid (systemic insecticide), *Pseudomonas fluorescence* (biocontrol agent) and Azophos (biofertilizer) in sequence and then dried in shade. Combined nutrient formulation is a nutrient consortium in powder form which is a combination of macronutrients (N, P and K),

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micronutrients (Zn, Fe, B, Mn) and plant growth regulators (NAA), produced by the Department of Crop Physiology, TNAU, Coimbatore.

Seeds were sown at a spacing of 30 x 30 cm. Full dose of N, P and K (35:23:23 kg N, P<sub>2</sub>O<sub>5</sub> and K<sub>2</sub>O/ha) was applied as basal. All agronomic management practices viz., gap filling, thinning, irrigation, weed management, harvesting and post harvest operations were provided uniformly to all the treatments.

Height of the tagged plants from the ground to the tip of the main stem was measured and the mean values were expressed in cm. Five plants were collected at random along with root from the sampling row, sun dried for three days followed by oven drying at 60° C and DMP was recorded and expressed in kg/ha. Capsules present in the tagged plants were counted and average was calculated to obtain the number of capsules per plant. The number of seeds per capsule were counted and recorded. One thousand seeds from each net plot produce were taken and their weight was estimated and expressed in gram. Cleaned and sun dried grains of net plot area were weighed and grain yield was computed

and expressed in kg/ha. The experimental data were subjected to statistical analysis using standard procedures.

## Results and Discussion

### Growth attributes

Plant height and dry matter production of sesame was significantly influenced by seed pelleting and foliar nutrition. At physiological maturity, pelleted seeds recorded significantly higher plant height (113.8 cm), number of branches (7.7) and dry matter production (3182 kg.ha<sup>-1</sup>) than non pelleted seeds. Higher plant height might be attributed to the increased availability of nutrients due to the presence of polymer coat and biofertilizers in the seed pelleting mixture, which facilitates for early germination of seeds. Early attainment of the autotrophic stage due to greater vigour in the initial stages of plant growth might be the reason for higher number of branches and dry matter production by plants produced from pelleted seeds (Sherin *et al.*, 2005). Kamaraj *et al.* (2017) reported similar results in sesame.

**Table 1. Effect of seed pelleting and foliar nutrition on growth attributes of sesame at physiological maturity**

Treatment	Plant height (cm)			DMP ( kg ha <sup>-1</sup> )			Number of branches		
	Pelleted (P1)	Non pelleted (P0)	Mean	Pelleted (P1)	Non pelleted (P0)	Mean	Pelleted (P1)	Non pelleted (P0)	Mean
T <sub>1</sub> : Urea (1%)	111.2	106.2	108.7	3005	2505	2755	7.8	5.5	6.7
T <sub>2</sub> : DAP (1%)	115.6	111.2	113.4	3250	2822	3036	8.1	6.1	7.1
T <sub>3</sub> : 19:19:19 (NPK) (1%)	122.6	118.2	120.4	3788	3110	3449	8.6	6.7	7.6
T <sub>4</sub> : MnSO <sub>4</sub> (0.5%)	109.5	106.2	107.9	2808	2313	2560	7.0	5.3	6.2
T <sub>5</sub> : MAP (0.5%)	112.5	108.3	110.4	3185	2700	2942	7.9	5.5	6.7
T <sub>6</sub> : Combined nutrient spray (2%)	130.7	124.0	127.4	4128	3585	3856	10.9	8.7	9.8
T <sub>7</sub> : Salicylic acid (100 ppm)	108.2	104.5	106.4	2785	2300	2542	6.5	5.2	5.8
T <sub>8</sub> : Control (no spray)	100.3	92.30	96.3	2505	2117	2311	5.2	4.7	4.9
Mean	113.8	108.9		3182	2682		7.7	6.0	
	SEd	CD (p=0.05)		SEd	CD (p=0.05)		SEd	CD (p=0.05)	
Pelleting	1.8	3.6		22	46		0.26	0.55	
Foliar spray	3.0	6.3		45	92		0.57	1.17	
P x F	5.0	NS		64	NS		0.64	NS	

Among various foliar spray, significantly higher plant height (127.4 cm), number of branches (9.8) and dry matter production (3856 kg.ha<sup>-1</sup>) at physiological maturity was registered by combined nutrient spray @ 2% at 30 and 45 DAS. This was followed by foliar spray of 19:19:19 @ 1% at 30 and 45 DAS, which recorded a plant height of 120.4 cm, number of branches of 7.6 and dry matter production of 3449 kg.ha<sup>-1</sup>. Macronutrients, micronutrients and plant growth regulators present in the combined nutrient formulation might be having a stimulatory effect on

cell division and enlargement, ultimately resulting in taller plants with more number of branches. Higher nutrient uptake and photosynthetic rate resulted in more dry matter accumulation. This is in consonance with the findings of Martin and Basavarajappa (2014) in sesame.

### Yield attributes

Yield attributes like number of capsules, number of seeds per capsule and thousand seed weight were favourably influenced by seed pelleting and

foliar nutrition. Pelleted seeds registered significantly higher number of capsules per plant (143.4), seeds per capsule (52.1) and thousand seed weight (2.90 g). Increased photosynthetic rate due to higher nutrient uptake and efficient translocation of photosynthates from source to sink might be the reason for higher yield attributes with seed pelleting. The results are in agreement with the results reported by Kiran *et al.* (2014) in sunflower.

Significantly higher number of capsules (153.2), seeds per capsule (58.4) and thousand seed weight (3.12 g) was recorded by combined nutrient spray

@ 2% at 30 and 45 DAS. This was followed by foliar spray of 19:19:19 @ 1% at 30 and 45 DAS. Supply of a combination of macro and micro nutrients and plant growth regulators through combined nutrient formulation facilitated for enhancing the number of floral buds and reducing the flower drop resulting in higher number of capsules. Efficient mobilization of metabolites from source to sink can be the reason for higher number of seeds per capsule and thousand seed weight. The results are in conformation with the findings of Shirazy *et al.* (2015) and Roul *et al.* (2017) in sesame.

**Table 2. Effect of seed pelleting and foliar nutrition on yield attributes and seed yield of sesame**

Treatment	Number of capsules/plant			Number of seeds per capsule			Thousand seed weight (g)			Yield (kg.ha <sup>-1</sup> )		
	Pelleted (P <sub>1</sub> )	Non pelleted (P <sub>0</sub> )	Mean	Pelleted (P <sub>1</sub> )	Non pelleted (P <sub>0</sub> )	Mean	Pelleted (P <sub>1</sub> )	Non pelleted (P <sub>0</sub> )	Mean	Pelleted (P <sub>1</sub> )	Non pelleted (P <sub>0</sub> )	Mean
T <sub>1</sub> : Urea (1%)	142.2	120.5	131.4	50.6	47.6	49.1	2.85	2.80	2.83	652	592	622
T <sub>2</sub> : DAP (1%)	144.6	124.2	134.4	55.0	50.2	52.6	2.91	2.88	2.90	674	633	654
T <sub>3</sub> : 19:19:19 (NPK) (1%)	154.3	130.7	142.5	58.1	53.7	55.9	3.00	3.02	3.01	710	665	688
T <sub>4</sub> : MnSO <sub>4</sub> (0.5%)	137.2	119.5	128.4	47.5	43.2	45.4	2.85	2.80	2.83	618	585	602
T <sub>5</sub> : MAP (0.5%)	142.7	123.0	132.9	54.4	50.0	52.2	2.90	2.84	2.87	660	605	633
T <sub>6</sub> : Combined nutrient spray (2%)	165.2	141.2	153.2	60.3	56.5	58.4	3.13	3.11	3.12	742	695	719
T <sub>7</sub> : Salicylic acid (100 ppm)	132.9	116.5	124.7	47.2	42.7	45.0	2.81	2.81	2.81	615	574	595
T <sub>8</sub> : Control (no spray)	127.8	112.3	120.1	43.8	39.5	41.7	2.71	2.69	2.70	608	566	587
Mean	143.4	123.5		52.1	47.9		2.90	2.87		659	614	
	SEd	CD (p=0.05)		SEd	CD (p=0.05)		SEd	CD (p=0.05)		SEd	CD (p=0.05)	
Pelleting	2.0	4.1		1.0	2.0		0.02	0.04		9	19	
Foliar spray	3.3	6.8		1.4	2.9		0.04	0.08		13	28	
P x F	13.4	NS		4.1	NS		0.34	NS		36	NS	

### Seed yield

Significant variation in seed yield was observed due to seed pelleting and foliar nutrition. Pelleted seeds recorded significantly higher seed yield (659 kg/ha) when compared to non pelleted seeds (614 kg.ha<sup>-1</sup>). The bio-inoculants and plant protectants in the seed pelleting mixture provided for higher plant stand per unit area and thereby the yield. The cumulative favourable effect of enhanced growth attributes and yield attributes might have resulted in higher seed yield. Similar findings were reported by Vasudevan *et al.* (2016) in groundnut.

Combined nutrient spray @ 2% at 30 and 45 DAS proved to be superior over other foliar nutrient sprays by registering a significantly higher yield of 719 kg/ha. The next highest seed yield (688 kg.ha<sup>-1</sup>) was recorded in foliar application on 19:19:19 @ 1% at 30 and 45 DAS. The increase in the seed yield with combined nutrient spray over the control was 22.4 per cent. This can be ascribed to the superiority in growth attributes and yield attributes due to easy availability and efficient utilization of nutrients by the plants. This is in confirmation with the results of Samadhiya (2017) in safflower.

### Conclusion

From the present study, it may be concluded that seed pelleting and foliar application of combined nutrient formulation @ 2% at 30 and 45 DAS is the best management option to get higher growth and yield in irrigated sesame.

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