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Effect of pre sowing botanical seed treatment on seed yield and quality in sesame (*Sesamum indicum L.*) *cv.* TMV 3

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Abstract
Sesame (*Sesamum indicum* L.), otherwise known as sesamum or beniseed, member of the family *Pedaliaceae* is one of the most ancient oilseeds crop known to mankind. Laboratory and field experiments were conducted to study the effect of pre sowing botanical seed treatment on seed quality and yield in sesame cv TMV 3. Observations on seed quality parameters viz., germination, root length, shoot length, dry matter production, vigour index and EC, growth parameters viz., field emergence, plant height, number of branches plant^{-1}, early days to first flowering, early days to 50% flowering and number of flowers plant^{-1}, physiological parameters viz., chlorophyll content, photosynthesis, transpiration, intercellular $C0_2$ concentration and stomatal conductance, yield attributing characteristics such as number of capsules plant^{-1}, capsule yield plant^{-1}, capsule yield plot^{-1}, number of seeds capsule^{-1}, seed weight capsule^{-1}, seed yield plant, seed yield plot^{-1} and resultant seed qualities such as germination percentage, root length, shoot length, dry matter production (10 seedling), vigour index were recorded. Based on the results, it was found that sesame seeds treated with Prosopis leaf extract @ 5% pre sowing treatment recorded higher seed quality and yield when compared to other treatments and control.

Keywords: sesame, prosopis pre sowing seed treatment, yield

Introduction
Sesame or gingelly (Sesamum indicum) commonly known as eil (Tamil) is an ancient oilseed crop grown in India, and perhaps the oldest oilseed crop in the world. The crop is now grown in a wide range of environments, extending from semi-arid tropics and subtropics to temperate regions. Consequently, the crop has a large diversity in cultivars and cultural systems. India is the largest producer of sesame in the world. It also ranks first in the world in terms of sesame-growing area (24%). Sesame seed is rich in fat, protein, carbohydrates, fibre and some minerals. The oil seed is renowned for its stability because it strongly resists oxidative rancidity even after long exposure to air. Seeds are basic for crop production. No agricultural practice can improve a crop beyond the limits set by the seed. Any achievement in the crop improvement can be propagated and established in field only through seeds. Hence, the production of high quality seed is necessary and important to the agricultural industry. The pre sowing treatment management practice recommended for dryland agriculture to resistant the seed against the adverse agro – ecological conditions which the seed face at the time of sowing until seed put fourth seedling on availability of moisture from rain. Hence, a study was undertaken in sesame cv. TMV 3. With the objective to evaluate the effect of the pre sowing botanical seed treatment on seed yield and quality in sesame.

Materials and Methods
The present investigations were carried out at the Department of Genetics and Plant Breeding, Faculty of Agriculture, Annamalai University to study the effect of the pre sowing botanical seed treatment on seed yield and quality in sesame. Freshly harvested bulk seeds of sesame cv. TMV 3 were graded and imposed with the following pre sowing seed treatments.

T_0 – Control
T_1 – Moringa leaf extract @ 5%
T_2 – Prosopis leaf extract @ 5%
T_3 – Neem leaf extract @ 5%
T_4 – Vasambu leaf extract @ 5%
T_5 – Pungam leaf extract @ 5%
T_6 – Arappu leaf extract @ 5%
T_7 – Papaya leaf extract @ 5%

The treatments were evaluated for seed quality parameters viz., germination (%), root length (cm), shoot length (cm), dry matter production (g seedling^{-10}), vigour index and EC, The above treated seeds were also evaluated for their field performance and the following growth parameters i.e. field emergence, plant height, number of branches plant^{-1}, early days to first flowering, early days to 50% flowering and number of flowers plant^{-1}, physiological parameters viz., chlorophyll content, photosynthesis, transpiration, intercellular $C0_2$ concentration and stomatal conductance, yield attributing characteristics such as number of capsules plant^{-1}, capsule yield plant^{-1}, capsule yield plot^{-1}, number of seeds capsule^{-1}, seed weight capsule^{-1}, seed yield plant, seed yield plot^{-1} and capsule seed recovery and resultant seed qualities such as germination percentage, root length, shoot length, dry matter production (10 seedling) and vigour index were recorded. All the data were analysed statistically with appropriate tools and expressed as mean values.

Results and Discussion
Researchers are recommending several pre sowing seed management techniques with the benefit of invigoration, protection and production (Sevanan, 1988) [15]. Several

researchers have improved the germination behavior of different crops under extremely varying conditions by seed fortification or seed hardening the seeds prior to planting. They concluded that such effects were due to activation caused by these treatments on that part of metabolism, which is related to germination and also to the diverse biochemical physiological mechanisms of stress tolerance; these last remaining inactive even under optimal environmental conditions (Heydecker and Coolbar, 1977) [5]. In present study, laboratory analysis the 5% *Prosopis* leaf extract hardened seeds recorded higher seed qualities viz., germination percentage, root length, shoot length, dry matter production and vigour index. The above mentioned treatment was recorded 21.1, 55.43, 38, 36, 90.35 percentage higher than control respectively with the abovementioned characters (Table. 1). Similar results were reported by Kamaraj and Padmavathi 2013 and Sathiya Narayanan *et al.,* 2015 [14] in green gram. This could be due to the modification of physiological and biochemical nature of the seeds so as to get the characters that were favorable for drought resistance (Henckel, 1964) [4]. The percentage of germination is an excellent indicator for survival and growth potential of seed. The *Prosopis* leaf extract (5%) hardened seeds would become physiologically advanced by carrying out some of the initial steps of germination and the subsequent improvement in germinability of these 5% *Prosopis* leaf extract hardened seeds could be due to fact that such advanced step in the germination process which on further placement for germination, remember the stage of initial imbibition step and continue from that stage for further growth and development. The first step of germination is formation of GA_3 and hydrolytic enzyme that aid in translocation of food material in simpler form to the germinating radical (Copeland, 1985) [3]. The reason for the higher germination of *Prosopis* leaf extract seed caused by due to the presence of greater hydration of colloids, higher viscosity and elasticity of protoplasm, increase in bound water content, lower water deficit, more efficient root system (May *et al.,* 1962) [8] and increased metabolic activities of seed that hastened by the hardening treatment also observed improvement in root and shoot growth seedling due to the earliness of germination and seedling growth in hardened seed. The increase in dry weight was claimed to be due to enhanced lipid utilization through glyoxalate cycle, a Primitive pathway leading to faster growth and development of seedling to reachautotrophic stage well in advance of others and enabling them to produce relatively more quantity of dry matter. Ultimately its leads to cause for the hike in vigour index by hardening treatment.

In the field experiment revealed that the 5%*Prosopis* leaf extract hardened seeds recorded higher values for the biometrical traits viz., field emergence, plant height, number of branches plant^{-1}, number of flowers plant^{-1}. Which were 20.27, 35.5, 50, and 34. 57 percentage higher than the control respectively with the above mentioned characters (Table. 2). The same trend in results were reported by Kamarajand Padmavathi 2013 and Sathiya Narayanan *et al.,* 2015 [14] in green gram. The gas exchange parameter such as chlorophyll content, photosynthesis, transpiration, intercellular CO_2 concentration and stomatal conductance also higher in 5% prosopis leaf extract pre sowing seed treatment which was 25, 17, 10, 16.18, 14.5 percentages higher than control respectively with the above mentioned characters (Table. 3). This treatment was also recorded the yield attributes character such as number of capsules plant^{-1}, dry weight of capsule^{-1}, number of seed capsule^{-1}, seed weight capsule^{-1} and seed yield plant^{-1} were also 30, 30.1, 21, 46.3, 54 percentage higher than control respectively with the above mentioned characters (Table 4). The similar results were reported by Sathiya Narayanan *et al,* 2015 [14]. Rapid and uniform field emergence are the two essential pre-requisites to increase the yield. Uniformity and percentage of seedling emergence, yield attributing characters of direct seeded crop have major impact on final yieldand quality. (Niranjanamurthy *et al.,* 1991) [11] in different crops. The Prosopis harening supplies the bio active materials such as GA like substances to seed, which play an important role in enhancing the seed vigour and seed germination. It leads the rapid growth under drought condition (Saitoh *et al*, 1991) [13].

Thus, the effect of pre sowing botanical seed treatment on seed yield and quality in sesame cv. TMV 3.revealed that 5%.*Prosopis* leaf extract hardened seeds recorded the higher seed yield and resultant seed quality when compared to other treatments and control.

Table 1: Effect of pre sowing botanical treatments on initial seed qualities in sesame cv.TMV3.

Treatment	Germination (%)	Root length (cm)	Shoot length (cm)	Drymatter production 10 seedlings (mg)	Vigour index
T_0	76(62.15)	9.2	6.1	36.2	1141
T_1	81(63.75)	10.8	6.4	39.5	1393
T_2	92(72.10)	14.3	8.4	49.1	2172
T_3	88(69.75)	12.7	7.9	48.2	1776
T_4	87(68.50)	12.1	7.1	47.3	1644
T_5	90(70.22)	14.1	8.2	49.2	1999
T_6	84(67.15)	11.9	7.0	46.2	1561
T_7	82(66.40)	11.5	6.7	43.9	1449
Mean	85.25(67.49)	12.09	7.22	44.98	1641
SED	2.979	0.082	0.070	0.187	0.661
CD	6.869	0.191	0.163	0.431	1.525

(Figures in parentheses are arc sine transformed values)

Table 2: Effect of pre sowing botanical treatments on various growth parameters in sesame cv.TMV3

Treatment	Field emergence (%)	Plant height (cm)	Number of branches	Days to first flowering	Days to 50 percent flowering
T_0	74(60.02)	90	4	44	53
T_1	76(61.07)	111	5	42	52
T_2	89(74.76)	122	6	31	40
T_3	84(67.43)	119	5	35	45
T_4	87(69.03)	115	5	41	50
T_5	86(68.04)	120	5	32	43
T_6	81(66.04)	116	5	38	46

T_7	78(65.13)	113	5	39	48
Mean	80.62(66.42)	115.41	4.83	37.83	46.95
SED	0.888	1.173	0.413	0.881	0.861
CD	1.960	2.517	0.886	1.891	1.847

(Figures in parentheses are arc sine transformed values)

Table 3: Effect of pre sowing botanical treatments on physiological parameters in sesame cv.TMV 3.

Treatment	Chlorophyll content (mg)	Pn (mg CO_2 $m^{-1}S^{-1}$)	Tr (mg H_2O CO_2 $m^{-1}S^{-1}$)	Ci (mol/mol)	CS (mol/mol. S)
T_0	0.073	17.3	7.961	260.1	0.461
T_1	0.078	17.8	7.998	271.2	0.478
T_2	0.091	20.2	8.722	302.2	0.528
T_3	0.087	19.1	8.391	208.3	0.501
T_4	0.085	19.2	8.412	299.2	0.512
T_5	0.088	19.4	8.601	301.2	0.521
T_6	0.084	18.5	8.211	280.2	0.483
T_7	0.083	18.4	8.118	279.2	0.492
Mean	0.083	18.83	8.302	285.2	0.497
SED	0.010	0.082	0.010	0.175	0.009
CD	0.021	0.177	0.021	0.377	0.019

Note: Pn – Photosynthetic rate, Tr - Transpiration rate, Ci – Intercellular CO_2-concentration and CS -Stomatal conductance

Table 4: Effect of pre sowing botanical treatments on various yield parameters in sesame cv.TMV 3.

Treatment	Number of capsules $plant^{-1}$	Dry weight of $capsule^{-1}$ (g)	Capsule yield $plant^{-1}$ (g)	Capsule yield $plot^{-1}$ (g)	Seed number $capsule^{-1}$	Seed yield $plant^{-1}$ (g)	Seed yield $plot^{-1}$ (g)
T_0	107	0.522	57.06	1986	63	23.50	997
T_1	126	0.561	73.18	2465	66	28.38	1058
T_2	139	0.679	85.14	2884	76	36.16	1218
T_3	135	0.641	79.09	2708	70	31.93	1112
T_4	131	0.659	82.10	2695	68	33.75	1151
T_5	137	0.671	84.09	2811	72	34.14	1199
T_6	130	0.600	78.26	2792	67	31.43	1098
T_7	127	0.588	75.33	2568	68	29.06	1074
Mean	128.87	0.593	71.45	2566	67.29	226.16	1139
SED	0.823	0.005	0.428	11.320	0.833	0.017	1.946
CD	1.767	0.010	0.919	24.282	1.787	0.038	4.175

(Figures in parentheses are arc sine transformed values)

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