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Performance Evaluation of Soaked Single Pod Sowing on Growth and Yield of Groundnut

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Abstract: ***Field trial was carried out during kharif 2017 at Oilseeds Research station Tindivanam to evaluate the performance of soaked single pods sowing in comparison with farmers practice (kernel sowing) on the growth and yield of groundnut variety (TMV 13). The experiment was carried out with 7 treatments viz., sowing of non soaked (dry) and soaked single pods in water with different soaking time (4, 8, 12, 16 and 20 hrs) compared with kernel sowing replicated thrice in a randomized block design. The results showed that there was a clear difference in the treatments of water soaked single pods as compared to dry sowing of single pod and kernel sowing on field emergence, days to 50% of flowering, plant height and root length. The no. of pods/plant and pod yield also higher in kernel sowing and water soaked single pods and significantly differ with the single pods without soaking in water.***

Keywords: Single pod sowing, dry and water soaking, growth parameters and yield

Introduction:

Groundnut is the sixth most important oilseed crop in the world. It contains 48-50% oil and 26-28% protein and is a rich source of dietary fiber, minerals, and vitamins. Groundnut is grown on 26.4 million ha worldwide with a total production of 37.1 million metric tonnes and an average productivity of 1.4 metric t/ha. Indian Council of Medical Research (ICMR) recommended consumption of 20 g edible oil /day/person by 2020 A.D. India requires around 20.3 million tonnes of edible oil (Karunaakaran *et al*., 2010). Over 100 countries worldwide grow groundnut. Developing countries constitute 97% of the global area and 94% of the global production of this crop. The production of groundnut is concentrated in Asia and Africa (56% and 40% of the global area and 68% and 25% of the global production, respectively). Groundnut (*Arachis hypogaea* L.) is the most important oilseed crop and also a food crop of India. The overall productivity of this crop is low (Rezaul Kabir *et al*., 2013). India, which adopted

groundnut as an agricultural crop by the late 19th century, gradually became the major groundnut producing country in the world within a span of 5-6 decades. India shares 22 per cent of the world production (area 4.9 m.ha with production of 5.8 m.tonnes). In Tamil Nadu, groundnut is an important and major oilseed crop, covering an area of 338300 hectares with a production of 783200 tonnes. Out of which 70% of the area is covered under rainfed crop and the remaining 30% is under irrigated conditions. The poor vigour and viability of seeds with adverse environmental conditions and improper storage facilities may result in poor crop establishment and non availability of certified fresh seed and use of old seeds ultimately decreases yield and this is most vital when seed is a costly input as in case of groundnut (Bhingarde *et al.*, 2015). The quality of seed used by farmers determines the status of agriculture they practice. However, for maximum gain in productivity the use of both improved varieties and improved integrated crop management practices are required. Not only do they contribute to increasing productivity individually, but they also act synergistically. Seed of improved varieties is a costly input; more so in the case of groundnut, where the non-availability of improved variety seed is a major constraint in most of the groundnut growing countries. The private sector has little interest in the groundnut seed enterprise – there is the low seed multiplication ratio, bulky nature of the produce, quick loss of seed viability, high cost of transportation, low profit margin and the self pollinated nature of the crop – therefore the task of making the seed of improved groundnut varieties available to farmers in required quantities and at the right price lies with the public sector seed services. Unfortunately, services have not been able to meet the demand of good quality seed of improved varieties of groundnut in many countries. There remains a large gap between the seed demand and seed supply resulting in low area coverage by improved varieties of groundnut in particular (Awadalla and Mohammed, 2017). Even though the groundnut plants produce more flowers than they can sustain to develop pods and seeds. About two-fifths of the flowers normally fail to develop from the outset, while another two-fifths produce only pegs and only one out of seven produces mature fruit. All the pegs that enter the soil also do not form mature pods. There are significant cultivar differences in the proportion of pegs developing into pods. The groundnut fruit normally referred to as a pod about 10 cm long and indehiscent. The mature pod normally contains 2 to 4 seeds. Occasionally even 5 or 6 seeds per pod also have been recorded. Single seeded pods are produced when all the ovules except the proximal one get aborted and these single seeded pods were not unshelled using decorticators. The single pods left as such in decorticator machine will have to be unshelled manually and used for sowing which is time and labour consuming and become difficult to go for kernels sowing especially in labour shortage period. Though, the formation of single pods is inevitable and there will be 4-5 single pods will be there each plant, which accounts 250-350kgs/ha. Use of these single pods sowing as such without shelling may helpful to the farmers, with proper seed priming techniques. since the single pods have to be unshelled one. In single groundnut plant at least there will be 4-5 single pods. In one hectare 250-300 kg of single pods could be separated which will be rejected from breeder seed lot. These single

pods will escape in all types of decorticators and collected as such along with shelled seeds. So these single pods to be used wisely to overcome the seed shortage, labour problem and time consuming. There is ample opportunity to go for sowing of single pods as such without shelling with some seed priming and hydration techniques. Keeping these facts in mind, the present trial was undertaken to study the sowing of soaked single pods and popularize the technique if found suitable under rainfed and irrigated condition.

Materials and Methods:

The research work was carried out at the Oilseeds Research Station, Tindivanam, a constituent research centre under Tamil Nadu Agricultural University, Coimbatore. Geographically the field is located at 12º5´ N Latitude and 79º50´E longitude at elevation of 49.6 m above the sea level with a Relative Humidity of 83-86%. The topography of the field was medium and the soil was sandy loam (Table 1) and well drained. The maximum and minimum temperatures may varied between 40ºC and 18.5ºC respectively. The normal annual rainfall is 1029.4mm is received in 63 rainy days. The northeast monsoon provides maximum amount of 601 mm rainfall in 29 rainy days and southwest monsoon providing 294 mm in 24 rainy days. The experimental field trial was laid out in field no. E1 of Oilseeds Research Station, Tindivanam during Kharif 2017 in randomized block design with three replications to evaluate the performance of sowing of soaked and non soaked single pods of groundnut (TMV13) in comparison with conventional method/farmers practice of sowing (Kernel sowing) under rainfed condition. The single pods were collected from the improved variety of groundnut, TMV 13 from the Oilseeds Research Station, Tindivanam. The soaked single pods and kernel seeds were sown in rows at a depth of 2-3 cm from the soil surface. The distances between row to row30 cm and between plants are 15cm. Sowing was taken up on 02.07.17 and the crop was harvested on 13.10.2017. Recommended dose of fertilizer (10:10:45 kg N: P_2O_5: K_2O/ha) were given as common to all the treatments mentioned above. The treatments viz., T_1- Sowing of single pod without soaking in water (Dry); T_2- Sowing of 4 hrs water soaked single pods in 1:3 ratio; T_3- Sowing of 8 hrs water soaked single pods in 1:3 ratio; T_4- Sowing of 12 hrs water soaked single pods in 1:3 ratio ; T_5- Sowing of 16 hrs water soaked single pods in 1:3 ratio; T_6- Sowing of 20 hrs water soaked single pods in 1:3 ratio and T_7- Kernel sowing without soaking in water (Farmer practice/conventional method) were imposed in 20m^2 (5x4m) size plots in randomized block design with 3 replications. The Growth, yield attributes and yield was subjected to ANOVA for statistical significance (Panse and Sukhtame, 1967). A total of 456 mm of rain was received in 24 rainy days during crop growth period of 2014-15. Three supplementary irrigations (30 mm) were given during 65, 75 and 85 days after sowing. The initial soil samples were analysed as per the standard methods and the results are given in table 1.

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Results and Discussion:

Effect of soaked single pods and kernel sowing on field emergence and growth parameters of groundnut

The results revealed that, there was a significant difference in the treatments under kernel sowing, water soaking and dry single pod sowing. The highest field emergence percentage (86.4%) was recorded in kernel sowing or conventional method of sowing followed by water soaked single pods for 20,16, 12 and 8 hrs, which are on par. The lowest field emergence percentage (76.4%) was recorded in sowing of single pod without soaking and followed by 4 hrs of water soaking. This might be due to hydration with certain period of time aided in initiation of early sprouting and resulted in accelerated the germination on account of which field emergence was enhanced (Subbaraman and Selvaraj, 1989; Narayanaswamy *et al*., 2012). Hydration with GA3 treatment stimulated the hypocotyls growth as GA3 includes cell elongation resulting in rapid emergence (Chandrakanth Pawar, 2006). Hydration with water was also enhanced the field emergence due to increased resistance on the resultant plant to heat and drought (Henkel, 1961) besides leaching of inhibitors (Sharrir, 1978) and enhancement of nucleic acid and protein synthesis (Sen and Osborne, 1974) resulting in better field performance of hydrated seeds. Likewise, it was observed that the days to 50% flowering was significant between dry sowing of single pod and water soaking. There was no significant difference among water soaked sowing and kernel sowing. The minimum days for 50% flowering was noticed in kernel sowing (33.3 days) followed by 20, 16, 12, 8 and 4 hrs of water soaking. The maximum days of 50% flowering was noticed under dry sowing of single pod, which is mainly due to late emergence of seedling and continued till the 50% flowering time. The beneficial effects of pre-sowing invigouration seed treatment have been primarily attributed to an advancement of germination process and flowering (Austin *et al.*, 1969; Hydecker, 1974) and improvement in other seed quality traits. The highest plant height (30.9 cm) was recorded kernel sowing followed by 20 and 16 hrs of water soaking of single pods and there was no significant difference among these treatments. But the lowest plant height (25.7cm) noticed in dry sowing of single pod significantly differ from the kernel sowing and water soaked treatments. The same trend has been noticed in the root length also. The enhancement in plant height with water soaking might be due to cell enlargement and increase in normal cell division. The enhanced field stand recorded with water soaked and kernel sown treatments may also be attributed to better root development and certain enzyme synthesis (Subbaraman and Selvaraj, 1989). From the Table 2, it was seen that the days to maturity differed significantly due to water soaking and kernel sowing as compared with dry sowing of single pods. The data on days to maturity of groundnut differed significantly due to water soaking treatments as compared to dry sowing of single pods. The increased and faster field emergence ultimately resulted in increased plant height, less number of days for 50 per cent flowering and earlier harvest maturity in $CaCl_2$ treated seeds followed by GA3 and water hydration (Narayanareddy and Biradarpatil, 2012) in sunflower.

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Effect of soaked single pods and kernel sowing on yield attributes and yield of groundnut

The results obtained from the field experiment indicated the superiority of kernel and water soaked single pod sowing over dry single pod sowing on yield parameters. More numbers of matured pods per palnt was noticed in kernel sowing (20.1) followed by sowing of water soaked single pods (20, 16 and 12 hrs). Lowest number of matured pods (15.4) was noticed in dry single pod sowing. The better crop growth and yield of groundnut under treatments with kernel sowing and water soaked single pods may be due to the activation of the synthesis of proteins, RNA, free amino acids and soluble sugars in the first phase of germination which will be advantages for subsequent phases of growth (Jyotsna and Srivastava, 1998). Early flowering and maturity might because of better early and faster emergence. Similar observations on advancement of flowering and harvest were also reported by Nagappa (1983) and Pawar *et al*. (2003). Significantly higher pod yield per ha was obtained with kernel sown treatment (2190 kg/ha) followed by water soaked single pods and significantly differ with lowest yield in dry single pod sowing (1715 kg/ha) (Table 2). Significant higher field emergence, number of pods per plant, test weight and pod yield were reported by Narayanaswamy and Channarayappa, (1996) in groundnut and Pawar *et al*. (2003) in sunflower. Hydration of single pods significantly influences the DMP and shelling percentage (table 2). Higher DMP (8481 kg/ha) was recorded in kernel sown followed by hydrated single pod sown treatments. Lowest DMP (6670 kg/ha) was noticed in dry sowing of single pod. The same trend was noticed in shelling percentage also. The increase in yield by hydration may be due to increase in the yield attributing traits such as field emergence percentage, number of pods per plant, final plant count and seed yield per plant. The results are in accordance with the results obtained by Narayanareddy and Biradarpatil, (2012) in sunflower.

Conclusion

The results of the present study indicated that single pods which are rejected in breeder seed lot and escaped from shelling in decorticator may wisely sown as such i.e without shelling to overcome the seed shortage, labour problem and time delay for shelling. The single pods can be sown after 16-20 hrs of soaking in water and shade drying. There was no significant difference in crop growth, yield and quality of groundnut as compared with the normal conventional/farmers' method of kernel sowing. So the new technique of soaked single pod sowing may popularize among the farmers to overcome the seed shortage, labour problem and timely sowing especially in rainfed condition.

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Table 1. Physical and chemical properties of initial soil samples

Field No	E1 of ORS, Tindivanam
Season	Kharif, 2017 (Rainfed)
Variety	TMV 13 (Gn)
Physical and chemical properties of initial soil	
pH	7.1
EC	0.1 dS m^{-1}
Organic C	3.1 g kg^{-1}
Bulk density	1.34 Mg m^{-3}
Porespace	40.4 %
Nitrogen	186 kg ha^{-1}
Phosphorus	20.2 kg ha^{-1}
Potassium	198 kg ha^{-1}
Sulphur	16.2 kg ha^{-1}
Exchangeable Ca ($meq100^{-1}$)	2.8 kg ha^{-1}

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Table 2.Effect of soaked single pod sowing on growth and yield of groundnut (TMV 13)

Treatment	**Field emergence (%)**	**50% flowering**	**Plant height(cm)**	**Root length (cm)**	**Days to maturity**	**Matured Pods (Nos)**	**Pod yield kgha^{-1}**	**Test weight (g)**	**Dry Matter Production (kg ha^{-1})**	**Shelling Percentage**
T_1- Sowing of sin gle pod without soaking in water (Dry)	76.4	39.1	25.7	9.65	112	15.4	1715	35.1	6670	70.2
T_2- Sowing of 4 hrs water soaked single pods in 1:3 ratio	78.1	38.8	26.2	10.18	110	16.5	1790	36.1	6964	70.6
T_3- Sowing of 8 hrs water soaked single pods in 1:3 ratio	83.1	37.5	27.8	10.29	108	17.4	1827	36.6	7111	70.8
T_4- Sowing of 12 hrs water soaked single pods in 1:3 ratio	83.2	36.9	28.9	10.57	107	18.3	1890	36.8	7361	71.3
T_5- Sowing of 16 hrs water soaked single pods in 1:3 ratio	83.9	35.4	29.1	11.24	104	19.1	1967	37.4	7655	71.9
T_6- Sowing of 20 hrs water soaked single pods in 1:3 ratio	84.8	34.9	29.5	11.92	103	19.6	2080	38.2	8092	72.6
T_7- Kernel sowing without soaking in water (Farmer practice/ Conventional method)	86.4	33.3	30.9	12.64	102	20.1	2190	38.9	8481	73.1
SEd	1.42	0.69	0.37	0.16	2.07	0.25	41.0	0.83	170.2	1.61
CD 0.05%	3.1	1.5	0.81	0.34	4.5	0.55	89.0	NS	369.4	NS

