Internat. J. Agric. Sci. Vol.3 No.2 June, 2007 : 52-56

Influence of different levels and sources of phosphorus, pressmud and PSM on dry matter partitioning and yield of summer groundnut

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ABSTRACT

The study was conducted to determine the effect of different source and level of phosphorus with and without pressmud and PSM on dry matter partitioning, pod and haulm yield of summer groundnut crop during summer seasons of 2002 and 2003 at Navsari. Total dry matter partitioning increased significantly upto harvest, leaves dry matter was increased upto 90 DAS and decreased thereafter where as stem dry matter accumulation increased from 30 DAS to at harvest and pod dry matter accumulation start from 90DAS and increased upto harvest. Single super phosphate perform better than diammonium phosphate. It was observed that leaves, stem, pod and total dry matter accumulation plant^{-1}, pod and haulm yield was enhanced due to optimum dose treatment receiving 15 kg P ha^{1} from SSP + 5 t pressmud ha^{-1} + 2.5 kg PSM ha^{-1}.

Key words : Phosphorus, Pressmud, PSM, Dry matter, Yield, Summer Groundnut.

INTRODUCTION

Groundnut is an important oilseed and cash crop of the country and is widely grown in between 40^{o} N and 40' S latitudes.In the past few decades increasing attention has been paid to the application of nutrient in different sources i.e. chemical, organic and bio-fertilizer (integrated) to increase yield . The pre-requisite for the any high yielding crops is its ability to produce higher amounts of total dry matter when compared with lower yielder. The manner in which the net dry matter produced and distributed among the different parts of the plant will determine the magnitude of the economic yield. But less attention on dry matter accumulation in groundnut crop, this factor is mainly responsible for getting higher crop production.

MATERIALS AND METHODS

The present investigation was conducted at Research Farm, Department of Agronomy, Navsari Agricultural University, Navsari during summer seasons of 2002 and 2003. The treatments comparised the combinations of three levels of phosphorus (0, 15, 30 kg P ha^{-1}) and its two sources (SSP and DAP) with and without pressmud (5 and 10 t ha^{-1}) and PSM (2.5 kg ha^{-1} soil application). Thus there were fifteen phosphorus management treatment combinations are as follows: T_1-2.5 kg PSM ha^{-1} only, T_2 -5 t pressmud ha^{-1} + 2.5 kg PSM ha^{-1}, T_3-10 t pressmud ha^{-1} + 2.5 kg PSM ha^{-1}, T_4-15 kg P ha^{-1} from DAP + T_1, T_5-15 kg P ha^{-1} from SSP + T_1, T_6-30 kg P ha^{-1} from DAP + T_1, T_7-30 kg P ha^{-1} from SSP + T_1, T_8-15 kg P ha^{-1} from DAP + T_2, T_9-15 kg P ha^{-1} from SSP + T_2, T_{10}-15 kg P ha^{-1} from DAP + T_3, T_{11}-15 kg P ha^{-1} from SSP + T_3, T_{12}-30 kg P ha^{-1} from DAP + T_2, T_{13}-30 kg P ha^{-1} from SSP + T_2, T_{14}-30 kg P ha^{-1} from DAP + T_3, T_{15}-30 kg P ha^{-1} from SSP + T_3. The experiment was laid out in randomized block design with three replications. The pH of the soil taken before laying the experiment was 8.0. organic carbon 3.9 g kg^{-1}, low in nitrogen 237 kg ha^{-1}, moderate in P (8.44 kg ha^{-1}) and rich in K (287.18 kg ha^{-1}). Irrigations were given when needed. A recommended package of practices were followed. During second year experiment was conducted on same site.

RESULTS AND DISCUSSION

Dry matter production (g) plant^{-1}

Dry matter accumulation in leaf, stem and reproductive organs and eventually the total dry matter accumulation plant^{-1} (Table 1 and 2) recorded at various growth stages clearly indicates that during vegetative stage, higher dry matter was accumulated in leaves, while at harvest its accumulation was higher in reproductive organs.

At 30 DAS, 59.09 per cent dry matter was accumulated in leaves while 40.91 per cent was accumulated in stem during 2002. During 2003 at the same crop growth stage, 59.04 per cent dry matter was accumulated in leaves and 40.96 per cent was accumulated in stem. The dry matter accumulation at 60 DAS was 63.57 per cent in leaves and 36.43 per cent in stem during 2002 crop season. The corresponding figures for 2003 were 63.66 and 36.34 per cent respectively.

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Table 1 : Partitioning of dry matter (g) plant^{-1} of groundnut at 30 and 60 DAS as influenced by phosphorus managements.

Treatment	30 DAS						60 DAS					
	Leaves		Stem		Total		Leaves		Stem		Total	
	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
T_1	0.353	0.477	0.257	0.333	0.61	0.81	3.127	3.527	1.563	1.747	4.69	5.27
T_2	0.350	0.490	0.257	0.323	0.61	0.81	3.320	3.497	2.023	2.130	5.34	5.63
T_3	0.347	0.480	0.270	0.327	0.62	0.81	4.043	4.560	2.380	2.643	6.42	7.20
T_4	0.377	0.500	0.260	0.327	0.64	0.83	3.643	3.683	2.050	2.070	5.69	5.75
T_5	0.373	0.470	0.260	0.330	0.63	0.80	3.620	3.750	2.260	2.300	5.88	6.05
T_6	0.403	0.510	0.270	0.353	0.67	0.86	3.917	4.450	2.353	2.647	6.27	7.10
T_7	0.410	0.510	0.273	0.350	0.68	0.86	3.997	4.523	2.373	2.633	6.37	7.16
T_8	0.373	0.460	0.260	0.340	0.63	0.80	4.267	4.783	2.420	2.670	6.69	7.45
T_9	0.400	0.487	0.257	0.340	0.66	0.83	4.617	4.863	2.650	2.730	7.27	7.59
T_{10}	0.400	0.470	0.280	0.340	0.68	0.81	4.567	4.870	2.660	2.740	7.23	7.61
T_{11}	0.410	0.473	0.277	0.340	0.69	0.81	4.550	4.847	2.730	2.747	7.28	7.59
T_{12}	0.430	0.507	0.277	0.347	0.71	0.85	4.883	5.073	2.757	2.820	7.64	7.89
T_{13}	0.417	0.510	0.280	0.350	0.70	0.86	4.923	5.113	2.773	2.880	7.70	7.99
T_{14}	0.433	0.513	0.283	0.350	0.72	0.86	5.010	5.107	2.673	2.967	7.68	8.07
T_{15}	0.430	0.513	0.283	0.353	0.71	0.87	5.160	5.180	2.763	3.007	7.92	8.19
S.Em.±	0.030	0.018	0.016	0.010	0.03	0.02	0.244	0.189	0.133	0.099	0.27	0.21
C.D.at 5%	NS	NS	NS	NS	NS	NS	0.707	0.546	0.385	0.286	0.78	0.62
C.V. %	13.20	6.38	10.57	5.15	9.12	4.48	9.96	7.23	9.47	6.62	7.03	5.22
G.M.	0.39	0.49	0.27	0.34	0.66	0.83	4.24	4.52	2.43	2.58	6.67	7.10

Table 2 : Partitioning of dry matter (g) plant^{-1} of groundnut at 90 DAS and at harvest as influenced by phosphorus managements.

Treatment	90 DAS								At harvest							
	Leaves		Stem		Pod		Total		Leaves		Stem		Pod		Total	
	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003	2002	2003
T_1	8.01	8.40	4.15	4.30	2.62	2.69	14.78	15.39	5.42	5.63	4.87	5.97	7.12	7.11	17.40	18.71
T_2	9.79	12.14	5.60	5.97	2.63	2.95	18.02	21.06	6.55	7.26	6.33	7.67	8.21	9.75	21.09	24.68
T_3	13.13	14.62	8.10	8.07	2.80	3.09	24.03	25.77	9.57	10.45	8.15	10.40	11.74	12.15	29.46	32.99
T_4	10.65	13.01	6.06	6.30	2.71	2.88	19.42	22.19	8.06	7.67	6.31	7.72	8.84	9.37	23.21	24.76
T_5	11.07	13.90	6.58	6.70	2.80	3.08	20.45	23.68	7.67	7.94	6.57	8.01	9.10	9.54	23.34	25.50
T_6	12.17	14.16	7.34	8.01	2.71	3.01	22.22	25.18	9.27	9.77	7.73	9.82	10.90	11.26	27.90	30.85
T_7	12.59	14.38	7.49	8.07	2.73	3.02	22.81	25.47	9.27	9.77	7.76	10.04	11.38	11.70	28.40	31.52
T_8	13.56	14.65	8.29	8.41	2.79	3.10	24.64	26.17	9.80	10.46	8.70	11.13	12.06	12.51	30.56	34.11
T_9	14.23	15.17	8.57	8.60	2.83	3.07	25.63	26.83	10.17	10.73	9.24	11.35	12.71	13.14	32.12	35.22
T_{10}	14.65	15.23	9.16	9.37	2.85	3.08	26.66	27.68	10.44	10.63	9.48	11.58	12.87	13.02	32.79	35.23
T_{11}	14.83	15.39	9.18	9.57	2.86	3.13	26.87	28.09	10.47	10.93	9.58	11.93	13.35	13.63	33.40	36.48
T_{12}	14.86	15.30	9.14	9.43	2.81	3.08	26.81	27.82	10.42	10.62	9.53	11.54	13.09	13.22	33.04	35.38
T_{13}	14.99	15.63	9.27	9.64	2.86	3.15	27.12	28.41	10.75	11.16	9.65	11.92	13.62	13.89	34.02	36.97
T_{14}	14.76	15.36	9.10	9.31	2.69	3.01	26.56	27.68	10.43	10.93	9.41	12.00	12.77	12.89	32.61	35.82
T_{15}	14.86	15.38	9.16	9.45	2.81	3.12	26.83	27.95	10.47	10.65	9.52	11.84	13.21	13.36	33.19	35.85
S.Em.±	0.55	0.43	0.32	0.37	0.09	0.23	0.70	0.58	0.38	0.25	0.51	0.46	0.53	0.44	0.94	0.62
C.D.at 5%	1.61	1.24	0.93	1.07	NS	NS	2.04	1.67	1.10	0.71	1.47	1.33	1.53	1.28	2.71	1.79
C.V. %	7.43	5.21	7.15	7.90	5.92	13.32	5.18	3.96	7.09	4.43	10.75	7.78	8.02	6.52	5.62	3.38
G.M.	12.94	14.18	7.81	8.08	2.77	3.03	23.52	25.29	9.25	9.64	8.19	10.20	11.40	11.77	28.84	31.60

At 90 DAS and at harvest the per cent dry matter accumulation in leaves, stem and pod were 55.02, 33.21 and 11.77 and 32.07, 28.40 and 39.53 per cent, respectively during 2002. The corresponding values for the year 2003 were 56.07, 31.95 and 11.98 and 30.51, 32.28 and 37.25 per cent, respectively.

Phosphorus management treatments significantly increased the total dry matter production plant^{-1} and its partitioning in different plant organs (leaves stem and total dry matter accumulation at 60 DAS and leaves, stem, pod and total dry matter accumulation at 90 DAS and at harvest) during both the years of experimentation (Table 1 and 2).

At 30 DAS, the total dry matter production plant^{-1} as well as its accumulation into plant organs (leaves and stem) were not affected significantly due to phosphorus management treatments during individual year. At 60 DAS crop growth stage, among the phosphorus management treatments the treatment receiving 30 kg P ha^{-1} from SSP + 10 t pressmud ha^{-1} + 2.5 kg PSM ha^{-1} (T_{15}) significantly increased the total dry matter accumulation and its accumulation in leaves and stem, however, it was statistically at par with almost all other treatments except treatments T_1 to T_8. Similar results were also found at 90 DAS and at harvest with some different sequences at same range during both the years, except pod weight plant^{-1} at 90 DAS was found non significant during both the years. The treatment T_1 (2.5 kg PSM ha^{-1} only) recorded significantly the lowest total dry matter production and its accumulation plant^{-1} at 60, 90 DAS and at harvest during both the years of experimentation, however, it remained at par with treatments T_2 / T_2 and T_4 at 60 DAS during 2002 and 2003, respectively. The decrease in leaves dry matter after 90 DAS may be due to N content in leaves transfer to reproductive organs at the time of pod filling. Similar increased in dry matter accumulation and its partitioning under the influence of phosphorus application was observed by Raghavaha *et al*. (1995) and Mudalangiryapay *et al*. (1997).

Pod and haulm yield (Kg ha^{-1})

Groundnut yield is an output of sequential metamorphosis from source to sink, partitioning of photosynthates in vegetative and reproductive parts goes simultaneously in the later growth phase. Pod and haulm yield ha^{-1} of groundnut (Table 3) were increased

Table 3 : Pod, haulm yield (kg ha^{-1}) and harvest index of groundnut as influenced by phosphorus managements

Treatment	Pod yield	(kg ha^{-1})	Haulm yield	(kg ha^{-1})
	2002	2003	2002	2003
T_1	1342.95	1479.42	3051.98	3133.54
T_2	1638.03	1744.11	3600.30	3664.67
T_3	2320.91	2487.69	4642.89	4827.35
T_4	1763.07	1928.29	3643.12	3724.76
T_5	1815.22	1960.53	3732.23	3871.75
T_6	2174.23	2329.52	4406.94	4522.40
T_7	2269.78	2420.03	4639.13	4721.80
T_8	2330.93	2512.99	4689.65	4847.07
T_9	2534.68	2686.41	4899.62	5016.17
T_{10}	2567.62	2778.86	5109.27	5204.19
T_{11}	2663.74	2905.05	5399.97	5508.22
T_{12}	2611.10	2816.05	5132.17	5302.35
T_{13}	2754.35	2999.00	5501.25	5736.00
T_{14}	2545.28	2738.45	5022.21	5155.27
T_{15}	2634.74	2886.84	5312.80	5420.67
S.Em.±	135.11	163.98	246.78	281.07
C.D.at 5%	391.30	474.94	714.75	814.05
C.V. %	10.33	11.62	9.32	10.34
G.M.	2264.40	2444.90	4585.60	4710.40

significantly due to application of 30 kg P ha^{-1} from SSP + 5 t pressmud ha^{-1} + 2.5 kg PSM ha^{-1} (T_{13}) and statistically at par with treatments 15 kg P ha^{-1} from SSP + 10 t pressmud ha^{-1} +2.5 kg PSM ha^{-1} (T_{11}), 30 kg P ha^{-1} from SSP/DAP + 10 t pressmud ha^{-1} + 2.5 kg PSM ha^{-1} (T_{15} / T_{14}), 15 kg P ha^{-1} from DAP + 10 t pressmud ha^{-1} + 2.5 kg PSM ha^{-1} (T_{10}) and 15 kg P ha^{-1} from SSP + 5 t pressmud ha^{-1} + 2.5 kg PSM ha^{-1} (T_9) in respect of pod and haulm yield ha^{-1} during both the years Similar findings were also reported by Ramesh and Sabale (2001).

In this experiment the interesting matter noted was that SSP source perform better than DAP in all growth and yield attributing characters, pod and haulm yield ha^{-1}. However, at each equal dose of phosphorus (SSP and DAP) source the treatment differences were non significant. The better performance of SSP than DAP may be attributed to presence of nearly 50 % $CaSO_4.2H_2O$, which supplied Ca and S to the crop during the growth period. Ca and S are essential nutrient for better yield and qualities of groundnut. Similar results were also observed by Reddy and Surekha (1996).

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Received : April, 2006; Accepted : January, 2007