

Original Research Article
**Dry matter accumulation and biomass partitioning of groundnut(*Arachis hypogaea* L.)
as influenced by sulphur levels and genotypes**

ABSTRACT

Groundnut is an important oilseed crop and belongs to the family of Leguminosae. However, the productivity of groundnut in India is less as compared to average productivity of the world. The main cause of the low groundnut production is an unbalanced and insufficient usage of nutrients. Because groundnut is a legume-oilseed crop, it has a high phosphorus, calcium, and Sulphur demand. Therefore, this field experiment was conducted during the *Kharif* season of 2023 at ~~erop~~ ~~Crop physiology~~ ~~Physiology field~~ ~~Field lab~~ ~~Laboratory~~, Department of Agronomy, CCS Haryana Agricultural University, Hisar. The experiment was laid out in split plot design with four genotypes (G₁-MH 4, G₂-HNG 10, G₃-HNG 69, G₄- GNH 804) in the main plots and four sulphur levels (S₁-Control, S₂-20 kg/ha, S₃-40 kg/ha, S₄-60 kg S/ha) in the sub-plots with three replications. ~~Result~~ ~~The results~~ revealed that among the four genotypes, GNH 804 ~~resulted in~~ ~~recorded~~ significantly higher total plant biomass and its partitioning into different plant parts viz, leaves, stem, root and pod at different growth stages in groundnut. ~~This was~~ followed by HNG 69. Among the sulphur levels, the 60 kg S/ha ~~treatment~~ recorded the ~~higher~~ ~~highest~~ dry matter accumulation, and this was closely followed by the sulphur level 40 kg S/ha. So, to obtain higher total dry matter accumulation and its partitioning, the genotype GNH 804 may be fertilized with 40 kg S/ha.

Key words: Biomass, genotypes, groundnut, partitioning, sulphur

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is one of the best-known oilseed crops and belongs to the family of Leguminosae and sub-family Papilionaceae. It is believed that it originated ~~in~~ ~~from~~ South America (Kamal *et al.*, 2023a; Hussainy *et al.*, 2023). Groundnut covers an area of 44.3 lakh ha with production of 86.5 lakh tonnes and productivity of 1953 kg ha⁻¹ in India during 2023-24. The major groundnut producing states in India are Gujrat, Rajasthan and Tamil Nadu.

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Groundnut accounts for 31.7% of India total oilseed production and about 28.3 % of the cultivated area of total oilseeds (Kamal *et al.*, 2024b; Aliet *et al.*, 2021).In India groundnut is grown in both ~~the seasons i.e., Kharif and Rabi~~seasons. ~~But However,~~ in Haryana groundnut is grown only in *Kharif* season over an area of 0.07 lakh ha with production and productivity of 0.08 lakh tonnes and 1080 kg ha⁻¹, respectively during 2023-24 (Anonymous, 2024).

There is less productivity of groundnut in India as compared to global average productivity ~~of world~~ due to uncertainty in monsoon rainfall ~~as well as~~and different bio-stresses such as diseases, insect pests and weeds. The main cause of low groundnut production is ~~an~~ theunbalanced and insufficient usage of nutrients. Because groundnut is a legume-oilseed crop, it has a high phosphorus, calcium, and sulphur demand (Sruthi *et al.*, 2021; Kamal *et al.*, 2023b).~~Variety~~ The type of variety and nutrient, especially sulphur ~~are~~is crucial for the physiological growth and yield of crops like groundnut. Selecting the appropriate variety is crucial for groundnut production. The adoption of high-yielding varieties has surged in recent years, bringing the country close to self-sufficiency in groundnut. Varieties suited to early *Kharif* differ significantly in growth habits compared to those suited for other seasons. Maintaining the optimum plant population per hectare for a given variety in a specific situation ~~does~~not only reduces cultivation costs but also maximizes the yield potential of the cultivar (Dileep *et al.*, 2021). Certain groundnut varieties have demonstrated that a poor source-to-sink relationship leads to the formation of more unfilled pods and a lower seed yield (Chandrasekaran *et al.*, 2007). Variety is therefore a key factor that affects the development, productivity, and quality of peanuts.

Sulphur plays a crucial role in several metabolic enzyme processes in plants, as it affects productivity both quantitatively and qualitatively (Sheoran *et al.*, 2013). Sulphur is essential in the process of synthesis of amino acids that contain sulphur, such as methionine and cysteine and it plays an important role in the synthesis of proteins, chlorophyll and oil (Kamal *et al.*, 2024a). The Sulphur-containing enzyme is also responsible for the synthesis of vitamins (biotin and thiamine), as well as co-enzyme A and metabolism of carbohydrates, proteins and fats. Biomass partitioning is the most influential physiological factor in yield determination of groundnut.The high yield is associated with rapid increase in pod number and near cessation of vegetative growth during pod filling. Based on the above reasons, a study was conducted to investigate~~how varying sulphur levels and genotypes influenced~~dry matter accumulation and biomass partitioning of groundnut~~as influenced by sulphur levels and genotypes~~.

MATERIALS AND METHODS

The field experiment was conducted during the *Kharif* season of 2023 at ~~the crop-Crop physiology-Physiology field-Field lab~~Laboratory of the, Department of Agronomy, CCS Haryana Agricultural University, Hisar.

Geographically, Hisar is situated ~~at-on~~29°10' N latitude and 75°46' E longitude, at an elevation of 215 m above mean sea level. The total rainfall received during the crop growing period was 176.1 mm. Weekly maximum and minimum temperatures remained under a suitable range for different crop growth stages. Average temperature on sowing date for crop season was 35.2°C, while average temperature at harvesting was 24.9°C. On the other hand, mean weekly maximum and minimum temperatures ranged between 30.5-39.1°C and 15.6-28.3°C, respectively during crop season. The experiment was laid out in split plot design with four genotypes (G₁-MH 4, G₂-HNG 10, G₃-HNG 69, G₄-GNH 804) in ~~the~~ main plots and four sulphur levels (S₁-Control, S₂-20 kg/ha, 10, S₃-40 kg/ha, S₄-60 kg S/ha) in ~~the~~ sub-plots with three replications. The soil of the field was sandy in texture, slightly alkaline in pH (8.1), ~~having normal~~ EC (0.15 ds/m), ~~low-inlow~~ organic carbon (0.12%), ~~low-inlow~~ available N (130.8 kg/ha), medium ~~in~~-available P (17.9 kg/ha), medium ~~in~~-available K (138.8 kg/ha) and low ~~in~~-available S (21.4 kg/ha). Standard cultural practices were followed for all treatments which was recommended ~~in-for~~groundnut crop.

Dry Matter Accumulation (g) and Partitioning

Three plants were randomly taken from one replication for recording the biomass of leaves, stem, root and pods at different growth stages (30, 60, 90 DAS and at maturity) of all the treatments. Plants were taken out with roots after thorough washing of the sand by water jet gently. The plants sampled from each replication were separated into leaves, stem, root and pod and were first dried in the sun and then in oven at 80°C for about 72 hours or more until a constant weight was obtained and then weighed. Dry matter accumulation per plant was calculated by adding the dry weights of individual plant parts and expressed in g/plant.

Percent Contribution of Plant Parts

Per cent contribution of individual plant parts at 30, 60, 90 days after sowing (DAS) and at maturity was computed by using the following formula:

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$$\text{Contribution of leaves to total dry weight of plant(\%)} = \frac{\text{Weight of leaves at a particular time}}{\text{Total dry weight of plant at the same time}} \times 100$$

$$\text{Contribution of stem to total dry weight of plant(\%)} = \frac{\text{Weight of stem at a particular time}}{\text{Total dry weight of plant at the same time}} \times 100$$

$$\text{Contribution of root to total dry weight of plant(\%)} = \frac{\text{Weight of root at a particular time}}{\text{Total dry weight of plant at the same time}} \times 100$$

$$\text{Contribution of pod to total dry weight of plant(\%)} = \frac{\text{Weight of pod at a particular time}}{\text{Total dry weight of plant at the same time}} \times 100$$

All the data recorded were analyzed with the help of analysis of variance (ANOVA) technique (Gomez and Gomez, 1984) for split plot design. The least significance test was used to decipher the effect of treatments at 5% level of significance.

RESULTS AND DISCUSSION

Effect of genotypes on dry matter, partitioning and percent contribution of plant parts:

The data pertaining to dry matter accumulation in various plant parts at 30 DAS are presented in Table 1. Significant variation among genotypes regarding dry matter accumulation in various plant parts and total dry weight was recorded at 30 DAS. However, ~~non-significant~~ ~~non-significant~~ variation was recorded among sulphur levels regarding ~~the~~ dry matter accumulation in various plant parts. Numerically, higher values for total dry matter accumulation at 30 DAS were recorded in GNH 804 genotype (2.73 g/plant) followed by HNG 69 (2.63 g/plant). Among genotypes ~~significantly higher~~ dry matter accumulation at 30 DAS in various plant parts leaves (1.23 g/plant), stem (0.66 g/plant) and root (0.84 g/plant) were recorded in GNH 804 genotype, which were 54.00, 69.23 and 147.05 percent higher over MH 4, respectively. A disquisition to data given in Figure 1 exhibited that the per cent contribution to total dry matter at 30 DAS was ~~more towards~~ ~~higher for~~ leaves ~~followed by~~ than stem and root. Among genotypes, the maximum per cent contribution to total dry matter in leaves (44.07 %) and root (26.27) was found in MH 4, while in stem (31.10) was found in HNG 10. A perusal of data in Table 2 ~~depicted~~ ~~revealed~~ that ~~the~~ dry matter accumulation in various plant parts at 60 DAS of groundnut was ~~significantly~~ affected by genotypes. Among ~~the four~~ genotypes, ~~significantly~~ higher dry matter accumulation in leaves (7.23 g/plant), stem (10.32 g/plant), root (3.01 g/plant) and pod (2.86 g/plant) were recorded with GNH 804, which were 34.88, 69.73, 67.22 and 146.55 percent higher over control, respectively. The higher values for total dry matter accumulation at 60 DAS were recorded in GNH 804 (23.90 g/plant), which was 59.86 per cent higher ~~over than~~ MH 4. ~~A probe to~~

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data presented in the results in Figure 2 unveiled that the per cent contribution to total dry matter at 60 DAS towards was higher for stem was more and medium followed by leaves and root. Among genotypes, the maximum dry matter in leaves (37.13 %) was found in MH 4, while in stem (44.27 %) and root (13.09) was found in HNG 69 and in pod (12.19) was found in GNH 804. A disquisition to data given in Table 3 exhibited that dry matter accumulation in various plant parts at 90 DAS of groundnut was significantly affected by genotypes. Amongst genotypes, significantly higher dry matter accumulation in leaves (16.60 g/plant), stem (16.72 g/plant), root (3.95 g/plant) and pod (8.59 g/plant) were recorded with GNH 804 which were 41.15, 45.89, 36.20 and 60.60 percent higher over MH 4, respectively but dry matter accumulation in leaves and pods were statistically at par with HNG 69. The higher values for total dry matter accumulation at 90 DAS were recorded in GNH 804 (46.06 g/plant) which was 31.81 per cent higher over MH 4. An inquisition to data showed in Figure 3 struted that the maximum per cent contribution to total dry matter at 90 DAS was towards leaves and followed by stem. Among genotypes maximum dry matter in leaves (37.63 %) and stem (36.77), root (8.55) was found in MH 4. while in pod (19.83 %) was found in HNG 10. A delve to data exhibited in Table 4 revealed that the total dry matter per plant was increased significantly with genotype variation. At the time of maturity, GNH 804 resulted-recorded in significantly higher dry matter accumulation in leaves (15.38 g/plant), stem (17.44 g/plant), root (1.75 g/plant) and pod (19.05 g/plant). The lowest dry matter in-of leaves (10.33 g/plant), stem (13.08g/plant), root (0.60g/plant) and pods (10.92 g/plant) were recorded with MH 4. It was-is also clear from data that at the time of maturity groundnut genotype GNH 804 accumulated significantly higher total dry matter per plant (57.52 g/plant) as compared to other genotypes. A perusal of data in Figure 4 depicted that the per cent contribution to total dry matter at maturity was more-in-higher for pod followed-by-and medium for stem, leaves and roots. Per cent contribution in various plant parts of groundnut at maturity was significantly influenced by genotypes. The per cent contribution to total dry matter towards leaves was significantly higher in HNG 10 (26.91%) followed by HNG 69 (26.90 %). The per cent contribution to total dry matter towards stem was significantly higher in MH 4 (33.43 %) followed by HNG 10 (31.50 %). Significantly higher per cent contribution to total dry matter was accumulated in root (3.03 %) when GNH 804 genotype crop was grown followed by HNG 69. While, the per cent contribution to total dry matter towards pods was higher in GNH 804 (39.90%) followed by HNG 69 (39.45%) during the experiment. The yield of groundnut genotypes differs mainly because of differences in their ability to develop the reproductive sink rather than differences in their leaf area or crop growth rate (Source). The peg production and pod formation are influenced differently by assimilate supply, the pegs may be initiated even when the plant does not have the assimilate status necessary to initiate pods on these pegs, however, once more pegs are initiated the assimilate supply is inadequate for the full achievement of reproductive growth potential which results in fewer and smaller kernels in each pod. The growth of groundnut fruit was influenced by the time of initiation

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relative to the changes in the assimilates supply of the crop. The pods initiated at a time when there is apparently no limitation to assimilate supply in the plant had a larger growth rate than those initiated later when the reproduction sink was most active. The preponderant effect of genotypic variation on various growth of groundnut due to increased utilization of carbohydrates for protein synthesis and physiological capacity to translocate them to organ of vegetative growth, resulting in increased growth characteristics. ~~Dry~~ The dry matter accumulation per plant ~~showed~~ shows an increasing trend up to maturity in the different genotypes. ~~This~~ This might be ~~due attributed to~~ the high leaf area index of varieties to produce more dry matter. ~~Reason~~ The reason ~~of for the~~ high LAI is the genetic make-up of the groundnut plants. Similar results have been reported by ~~(Kalaiyarasan et al. (2019); Nurezannat et al. (2019); and Manaf et al. (2017).~~

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Effect of sulphur levels on dry matter, partitioning and percent contribution of plant parts:

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~~A perusal of~~ The data presented in Table 1 ~~depicted~~ showed that among sulphur levels, higher dry matter accumulation at 30 DAS in various plant parts leaves (1.12 g/plant), stem (0.60 g/plant) and root (0.71 g/plant) were recorded with 60 kg/ha sulphur level, which were 21.73, 17.64 and 31.48 percent higher ~~over than the~~ control, respectively. Numerically, higher values for total dry matter accumulation at 30 DAS were recorded in sulphur level at 60 kg/ha, followed by 40 kg/ha. An inquisition to data showed in Figure 1 ~~strutted~~ that among sulphur level, the maximum per cent contribution to dry matter in leaves was ~~accumulated by~~ recorded in control treatment (47.48%), followed by 20 kg S/ha (46.61 %), while in the stem was ~~accumulated by~~ maximum dry matter accumulation was recorded at 40 kg S/ha (30.29 %), followed by 60 kg S/ha (29.56 %) and in roots, ~~was accumulated by~~ maximum dry matter accumulation was recorded in control treatment (26.51 %), followed by 20 kg S/ha (24.81 %). ~~A delve to data given in Table 2 presented that sulphur levels also affected the dry matter accumulation significantly in different plant parts at 60 DAS. Significantly higher dry matter accumulation in leaves (7.16 g/plant), stem (9.36 g/plant), root (2.73 g/plant) and pod (2.57 g/plant) were recorded in 60 kg S/ha sulphur level, which were 26.31, 16.66 and 55.75 percent higher over than the control, respectively. Significantly higher total dry matter accumulation was recorded in 60 kg S/ha (22.41 g/plant) compared to all the other levels. A delve to data exhibited in Figure 2 revealed that among the sulphur levels, the maximum per cent contribution to total dry matter in leaves was accumulated by recorded in 40 kg S/ha (33.91 %), in the stems and roots, was accumulated by the highest accumulation of dry matter was recorded in the control treatment (44.31 %) and (14.08 %), respectively, while in the pods, was accumulated by the highest accumulation of dry matter was observed in 60 kg S/ha (11.27%). However, the minimum per cent contribution to dry matter in leaves (32.17 %) and pods (9.43 %) was accumulated by recorded in the control treatment while the minimum contribution of in the stems and roots, the lowest dry matter accumulation (42.63%) and root (12.17%), respectively was recorded with in 40 kg S/ha. A probe to~~

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data presented in Table 3 unveiled that sulphur levels also affected the dry matter accumulation significantly in different plant parts. Significantly higher dry matter accumulation in leaves (16.12 g/plant), stem (15.57 g/plant), root (3.71 g/plant) and pod (8.25 g/plant) were recorded in 60 kg S/ha level, which were 21.611, 14.90, 13.80 and 22.58 per cent higher over than the control treatment, respectively. Significantly higher total dry matter accumulation was recorded in 60 kg S/ha (43.42 g/plant), which was 18.60 per cent higher over than the control. A perusal of data presented in Figure 3 depicted that among sulphur level, maximum per cent contribution to total dry matter in leaves was accumulated by recorded in 60 kg S/ha treatment (37.17%), followed by 40 kg S/ha (37.15 %). In the stems, was accumulated the highest accumulation of dry matter was recorded by in the control treatment (37.08 %) followed by 20 kg S/ha (36.28 %). In the pods, was accumulated by the highest dry matter accumulation was recorded in 60 S/ha treatment (18.93 %), followed by 40 kg S/ha (18.80 %) and in root in root, was accumulated by in the control treatment (8.35 %), followed by 20 kg S/ha (8.07 %). A probe to data presented in Table 4 revealed that sulphur levels at 60 kg/ha produced higher dry matter accumulation in leaves (14.40 g/plant), stems (16.50 g/plant), roots (1.49 g/plant) and in pods (17.20 g/plant), which were statistically similar with Sulphur levels at 40 kg S/ha. The Sulphur level at 60 kg/ha was found significantly superior in terms of total dry matter accumulation per plant (53.68g/plant) at maturity, which was at par with 40 kg S/ha (52.61g/plant). A delve to data given in Figure 4 presented that among the sulphur levels, the maximum per cent contribution to total dry matter in leaves (26.92 %), pods (39.57%) and roots (2.71 %) was recorded in treatment at 60 kg S/ha. In the stems, the highest dry matter contribution (32.29 %) was recorded by for Sulphur treatment at 60 kg S/ha. However, the minimum per cent contribution to total dry matter in leaves (26.13 %) and root (2.17 %) was accumulated by recorded in the control treatment. In the stems and pods, the highest dry matter accumulation (30.91 % and 39.1) was accumulated by recorded in Sulphur levels at 60 kg S/ha and in pod (39.06%) accumulated by and 40 kg S/ha, respectively. The growth at higher levels of sulphur might be because sulphur plays a due to the crucial role that Sulphur plays in many several physiological and biochemical processes that are essential for plant development, and. In addition, its application to deficient soils can promote overall plant growth. Sulphur is associated with the improvement of sulphur-containing amino acids and vitamins, which play a direct role in the vegetative and reproductive parts-growth of plants. Improved growth due to sulphur fertilizer, in combination with higher photosynthesis on one hand and greater mobilization of photosynthates towards reproductive structures on the other hand, may have contributed to a-the large rise in increase in groundnut yield-parameters. Sink strength is reflected in its higher demand for photosynthates and sufficient supply of sulphur also aids in the development of floral primordial or reproductive parts, which might have resulted in the development of pods and kernels in plants. The distribution of available photosynthate to reproductive components could be improved by selecting for more determinate types that cease stem growth as soon as the kernels start growing, and which have the

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capacity for growth in the kernel to use all the assimilate produced during the reproductive phase. For high yield, peak kernel growth had to occur while leaf area was adequate to achieve the full potential of the kernel sink. It has been observed that the yield continues to increase because of continued pod setting, even though assimilate (source) shortage are likely. Thus, ~~in groundnut~~, it can be concluded that both source and sink are limiting factors ~~in groundnut~~ depending upon the varieties, ~~but though~~ in most cases the source is adequate and only sink is the limiting factor. Stimulation of photosynthesis of a large sink and the utilization of materials accumulated in vegetative structures could contribute to increasing the yield of groundnut. Similar results have been reported by ~~(Kamal et al. (2024a; Kamal et al. and 2024b).~~

CONCLUSION

The results of the present study revealed that genotypes and sulphur application significantly improved the dry matter accumulation and biomass partitioning in groundnut. Among the four genotypes under study, GNH 804 resulted in significantly higher total plant biomass and its partitioning into different plant parts viz, leaves, stem, root and pod at different growth stages in groundnut. This was followed by HNG 69. ~~So, to~~ Therefore, in order to obtain higher total dry matter accumulation and its partitioning, the genotype GNH 804 may be fertilized with 40 kg S/ha. Among the sulphur levels, 60 kg S/ha recorded higher dry matter accumulation. This was closely followed by sulphur level 40 kg S/ha. ~~So, to~~ Therefore, in order to obtain higher total dry matter accumulation and its partitioning, the genotype GNH 804 may be fertilized with 40 kg S/ha.

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Table 1. Effect of sulphur levels on dry matter accumulation (g/ plant) in various plant parts at 30 DAS of groundnut genotypes

Treatment	Dry matter accumulation (g) in various plant parts at 30 DAS			
	Leaves	Stem	Root	Total
Genotypes				
MH 4	0.69	0.39	0.34	1.41
HNG 10	1.09	0.56	0.65	2.31
HNG 69	1.21	0.63	0.79	2.63
GNH 804	1.23	0.66	0.84	2.73
SEm ±	0.09	0.05	0.01	0.09
CD at 5%	0.33	0.17	0.03	0.03
Sulphur levels (kg S /ha)				
Control	0.92	0.51	0.54	2.01
20	1.05	0.55	0.65	2.26
40	1.10	0.58	0.71	2.36
60	1.12	0.60	0.71	2.44
SEm ±	0.07	0.04	0.01	0.08

Comment [FO41]: Please do a more detailed background review on dry matter accumulation rating. This can improve the quality of your findings appropriately.

Table 2.	CD at 5%	NS	NS	0.035	0.25
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Effect of sulphur levels on dry matter accumulation (g/plant) in various plant parts at 60 DAS of groundnut genotypes

Treatment	Dry matter accumulation (g) in various plant parts at 60 DAS				
	Leaves	Stem	Root	Pod	Total
Genotypes					
MH 4	5.36	6.08	1.80	1.16	14.95
HNG 10	6.54	8.38	2.52	2.14	20.24
HNG 69	6.66	9.67	2.85	2.66	22.50
GNH 804	7.23	10.32	3.01	2.86	23.90
SEm ±	0.04	0.04	0.03	0.01	0.08
CD at 5%	0.13	0.13	0.11	0.03	0.27
Sulphur levels (kg S /ha)					
Control	5.26	7.41	2.34	1.65	17.27
20	6.36	8.56	2.51	2.15	20.19
40	7.01	9.11	2.60	2.45	21.79
60	7.16	9.36	2.73	2.57	22.41
SEm ±	0.03	0.06	0.03	0.02	0.05
CD at 5%	0.09	0.17	0.09	0.05	0.15

Effect of sulphur levels on dry matter accumulation (g/plant) in various plant parts at 90 DAS of groundnut genotypes

Treatment	Dry matter accumulation (g) in various plant parts at 90 DAS				
	Leaves	Stem	Root	Pod	Total
Genotypes					
MH 4	11.76	11.46	2.90	5.33	31.22
HNG 10	15.21	14.78	3.51	8.23	41.48
HNG 69	16.71	16.33	3.82	8.52	45.13
GNH 804	16.60	16.72	3.95	8.59	45.60
SEm ±	0.09	0.06	0.02	0.05	0.12
CD at 5%	0.31	0.22	0.07	0.19	0.38
Sulphur levels (kg S /ha)					
Control	13.28	13.55	3.26	6.73	36.61
20	15.09	14.80	3.54	7.63	40.81
40	15.79	15.36	3.67	8.04	42.58
60	16.12	15.57	3.71	8.25	43.42
SEm ±	0.09	0.14	0.03	0.06	0.21
CD at 5%	0.28	0.41	0.09	0.18	0.63

levels on dry matter accumulation (g/plant) in various plant parts at maturity of groundnut genotypes

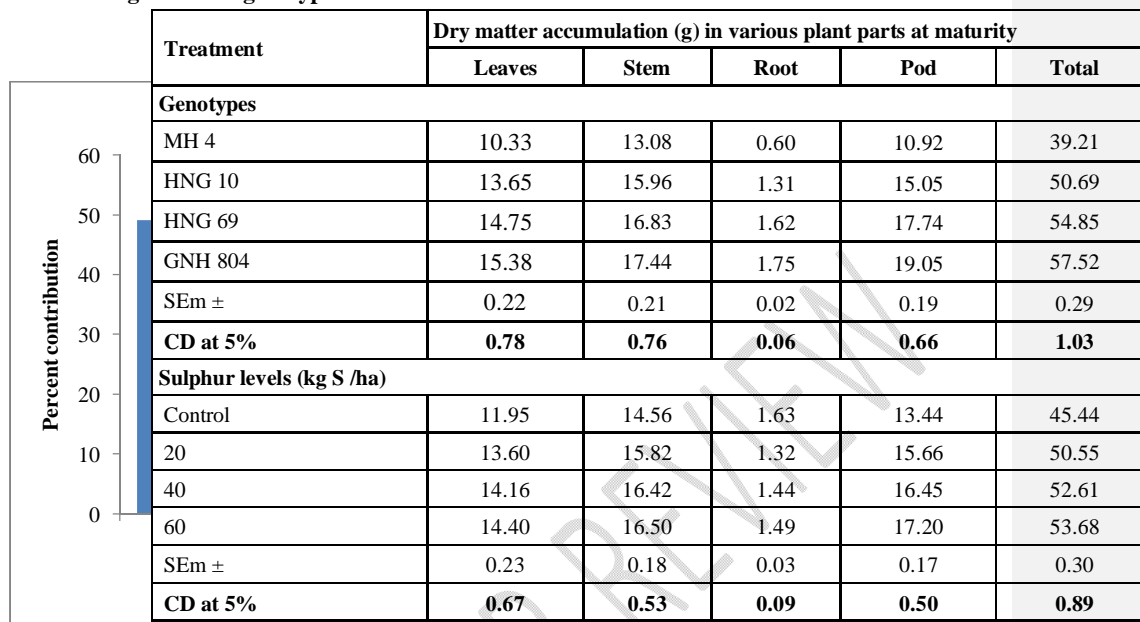


Figure 1: Effect of sulphur levels on per cent contribution in various plant parts at 30DAS of groundnut genotypes

Comment [FO42]: Also, please do a more detailed background review on sulphur rating in different plant parts. This can improve the quality of your findings appropriately.

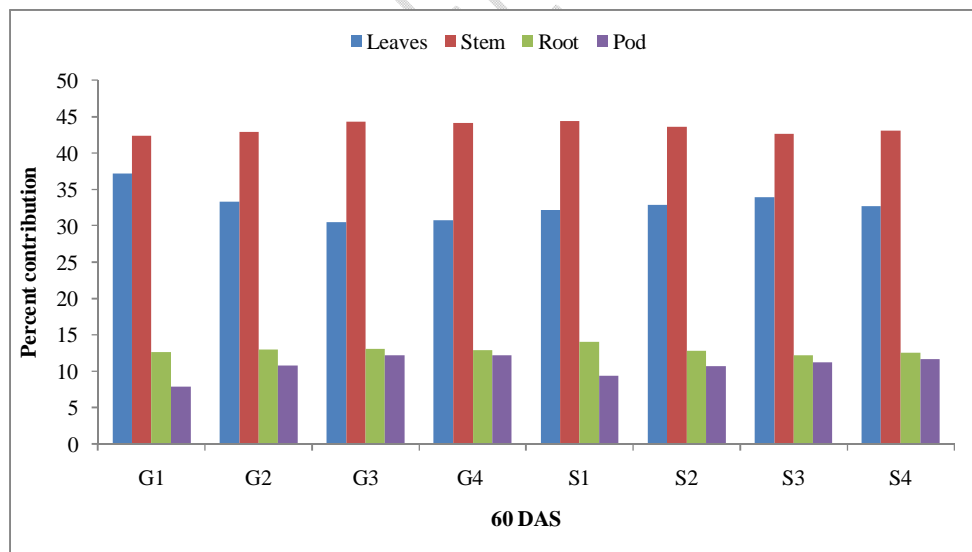


Figure 2: Effect of sulphur levels on per cent contribution in various plant parts at 60 DAS of groundnut genotypes

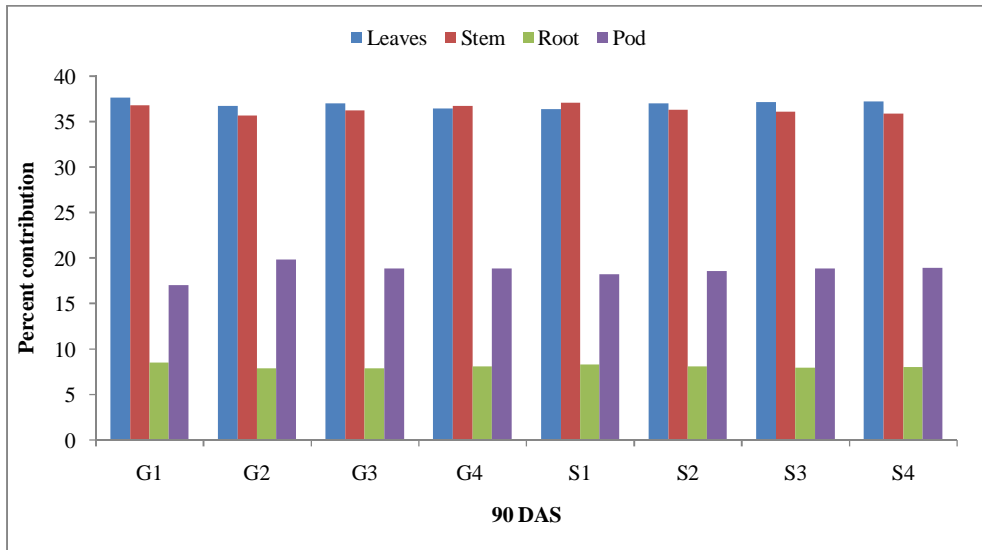


Figure3: Effect of sulphur levels on per cent contribution in various plant parts at 90 DAS of groundnut genotypes

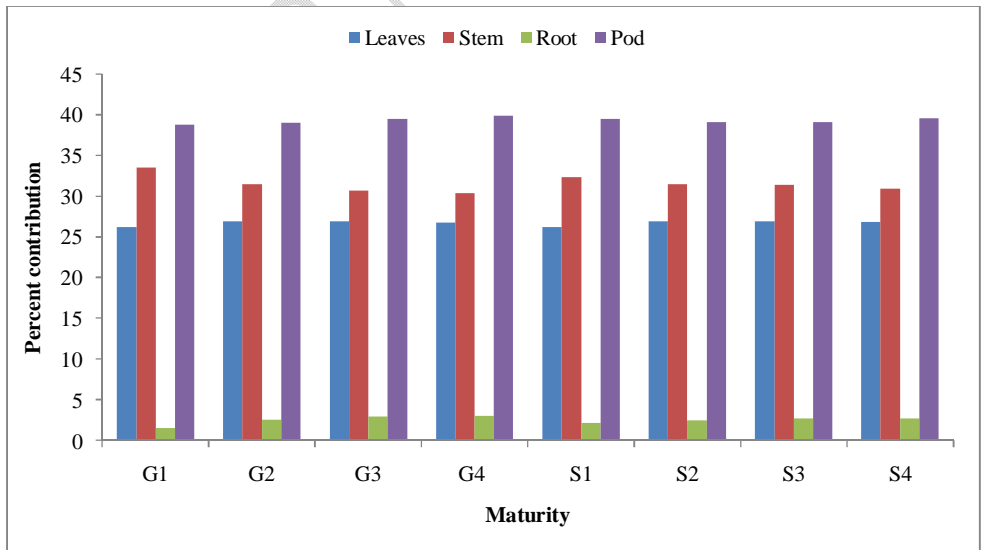


Figure4: Effect of sulphur levels on per cent contribution in various plant parts at maturity of groundnut genotypes

groundnut genotypes

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