International Research Journal of Engineering, IT & Scientific Research
Available online at https://sloap.org/journals/index.php/irjeis/
Vol. 2 No. 11, November 2016, pages: 29~40
ISSN: 2454-2261
https://sloap.org/journals/index.php/irjeis/article/view/519

Growth and Production of Genotypes of Peanuts in Double Stress: Drought and Shade

Ida Wahyuni [a]
A Farid Hemon [b]
Kisman [c]

Article history:

Received: 9 June 2016
Accepted: 30 September 2016
Published: 30 November 2016

Keywords:

cultivation;
drought;
growth and production;
peanut;
shade;

Abstract

Cultivation of peanuts provides higher returns compared to other crops, such as; corn, soybeans, and green beans. Peanut is a commercial crop and as an important source of income for farmers either on dry land or in the paddy field of rice crop marks. Peanut risk of crop failure due to pests and diseases is smaller than the soybean. This study aims at investigating the growth and production of peanut genotypes on double Stress: drought and shade. Findings show the treatments of shade and without shade, field capacity and drought have a significant influence on the parameters at the growth phase; flowering, plant height at the age of 30 HST, plant height at the age of 60 HST, the number of leaves at the age of 30 HST, number of leaves at the age of 60 HST, the number of branches at the age of 30 HST, and the number of branches at the age of 60 HST. Treatments of shade and unshade, field capacity and drought have a significant influence on the parameters in the productive phase, namely the total number of pods on the harvest, the total number of pod contains, heavy-wet stover, and heavy dry stover. The treatments of genotypes providing the best results are strains 6 (G6) and 8 (G8) for the best growth phase in all parameters and strains 10 (G10) for the best productive phase in the parameter of the pods total and pods contains.

Author correspondence:
Ida Wahyuni,
Study Program of Dryland Resource Management, the University of Mataram, Indonesia
Email address: idawahyuni@gmail.com

[a] Study Program of Dryland Resource Management, the University of Mataram, Indonesia
[b] Study Program of Dryland Resource Management, the University of Mataram, Indonesia
[c] Study Program of Dryland Resource Management, the University of Mataram, Indonesia

1. Introduction

Peanuts, Arachis hypogaea L., is the most important legume crop after soybeans having a strategic role in national food as a source of protein and vegetable oil. Peanuts can be consumed in a variety of forms, such as; vegetable-ingredients, bean-atom, egg-beans, arrowroot bean cake, fried or boiled. As an industrial material, it can also be made for sauce, cheese, butter, and oil. Peanut leaves can be used for fodder and green manure (Suprapto, 2008).

Domestic products have not met the necessity of peanut in Indonesia (Kasno, 2007). The rate of its production is still low, between 0.7-1.5 tonnes/ha dry pods; however, with intensive cultivations, it can achieve 2-2.5 tonnes/ha dry pods (Sumarno, 2003). This has led Indonesia to import peanuts as many as 205,275 tons and put Indonesia as the world's largest importer of peanuts (FAO, 2011). The consumption of peanuts per capita is 2.7 kg/capita/ year, with a total population of 241 million in 2011 and the rate of population increase on average 1.32% (Anonymous, 2013). If this continues, the production gap and consumption of peanuts will be higher. Therefore, the increase in peanut production is absolutely necessary in order to reduce the number of imports.

According to national data, the harvest area is 541,340 ha on which the average productivity of peanuts is only 1.45 tonnes/ha (CBS, 2013). Nationally, peanut productivity is still low compared to the potential yield varieties of Balitkabi Malang (4.3 ton/ha). Peanut production in NTB is 60,440 tons on harvested area of 30 671 hectares, or 1.9 tonnes/ha (BPS, 2013). The low production, compared to the actual yield potential of new varieties of peanut, is due to several factors such as the effect of drought stress (Hemon, 2009).

Planting peanuts in Indonesia, especially in NTB on dry land or in the fields, is generally planted on the end even of the dry season or rainy season.

Water is a major barrier to the crop production on the dry land. Drought stress is highly undesirable in the cultivation of plants because it can inhibit the growth and production of the plants. Drought effect on aspects of plant growth includes the plants' anatomy, morphology, physiology, and biochemistry. The drought causes the unavailability of water supply throughout the growing season; thus, the peanut production becomes low (Collino *et al.*, 2000).

There are various efforts having been made to stimulate increased production of peanuts of which the use of tolerant varieties to drought stress by applying the correct cultivation techniques. Research done by Hemon and Sumarjan (2012) has produced some mutant strains M4 of the peanut which was the result of mutations induced by gamma rays being able to be tolerant to the drought. This aims to obtain strains which are adaptively genetic stable properties and high yield in dryland.

Another issue is the effect of shade on peanuts which can also become the factor of production reduction. Shading results in changes to the light received by the plant, both in intensity and quality. Light has considerable influences on the photochemical process and the plant's shape and size. Yet, the shade does not change the morphological form of epidermal cells and stomatal types (Sundari *et al.*, 2005).

This study aims at investigating the growth and production of peanut genotypes on Double Stress: drought and shade.

2. Materials and Methods

This study has been conducted at the Laboratory of Production and Immunology, the University of Mataram and at Home Plastik in Land Agricultural Experiment of Vocational High School Mataram - the district of Labuapi - West Lombok Regency.

Materials and tools used in this study include: NanoDrop, Spectrophotometer, micropipettes, filter paper, ethanol 96%, blue tip, yellow tip, transparent nail polish, water, plant-stems of peanuts, seeds of 10 lines of peanut a result of gamma-ray irradiations (A petri dish, Erlenmeyer, microscopes, measuring cups, analytical balance, auto clap, cook Boren), a tool in the field (meter, hoes, machetes, scoop, poly defender, cutter, scissors, nail, wire, transparent isolate, buckets, transparent plastics, bamboo, paranet, nets, scoop) and stationery.

This study uses a Split Split Plot Design. A shade (N) factor as the main plot consists of two levels, i.e. N0 = Without Shade and N1 = 65% by using black paranet. Without giving shade (N0) means peanut genotypes grown without shade and N1 (giving shade 65% means that the incoming light on the growth of peanuts that can be used is equal to 65%). Meanwhile, drought factor as the subplot consists of two levels, namely K0 = Capacity Field (Dry) and K1 = Stress Drought (Optimum).

A factor of genotype peanuts as a sub-sub-plot consists of 10 levels, i.e. G1 = Strain 1, G2 = Strain 2, G3 = Strain 3, G4 = Strain 4, G5 = Strain 5, G6 = strain 6, G7 = strain 7 strain G8 = 8, G9 = Strain 9 and G10 = strain 10. In this study, there were 40 combined treatments and each treatment was repeated three times to obtain 120 experimental units (polybag). Data were then analyzed using analysis of variance and a further LSD test at a significant level of 5%. Media plant is the land taken from former land rice planting, the soil is dried in the sun until dry soil conditions (can be sifted). The soil is put into a polybag, weighing 10 kg/polybag, as the result of a combination of treatments. 10 strains of seed peanuts are planted in polybags in accordance with a predetermined treatment in this study. Before the seeds inserted into the planting hole having been prepared in advance in each planting hole sprinkled with 3G furadan, and planted the seeds of a peanut then covered with fine soil. There are 240 plant trees from all over the experimental units. The arrangements of polibeg placement aim to follow a spacing of 40 x 20 cm.

Drought Stress Treatment

All plants are watered to field capacity from the initial planting to 14 days old. Field capacity is determined by flushing water to the growing media until saturated. Water saturation is indicated by dribbling water on the basis of aeration holes of the polybag. Drought stress treatment can be given from the old plants 15 days after planting until 85 days after transplanting (DAT). At the age of 15 days after planting, most plants do not experience drought stress (plants in conditions of soil moisture field capacity); however, some others are maintained under conditions of drought stress in part due to a reduction in the water provision. Plants experiencing drought stress are watered to field capacity each 4-7 days (a day after a 70% wilt symptoms on leaves). Wilting symptoms begin to occur when soil water content reaches (<60-70%) of field capacity, calculated based on the difference in weight of the amount of water thrown to reach field capacity and when the plants begin to wilt. Drought stress treatment is given to 85-day-old plants. The next crop is given the optimum conditions to certain crops (Hemon, 2006).

Plant maintenance activities include fertilizing, weeding, watering, and pest and disease control.

Parameters of Plant Growth

The variable factors which can be observed in the growth phase of peanut plants are as follows: during flowering, plant height (cm), the number of leaves, the number of branches. Parameter observations of the crops are conducted at the harvest time. Outcome Parameter. Observations include: the number of total pods per plant, the number of pods contains, the weight of pods contain (g), the weight of wet-stover (g), the weight of dry stover (g), and the measurement of chlorophyll. Data analysis. All the observed data are analyzed statistically using analysis of variance (ANOVA) - Split Split Plot Design at the 5% significance level. Further, if there is a significant difference on the main plot, subplot, and sub-subplot, it will have a further test using different test average with BNT at 5% significance level.

3. Results and Discussions

3.1 The growth of Peanut Plant

The parameters observed in the growth phase of peanut plants are flowering time, plant height at 30 DAT and 60 DAT, the number of leaves at the age of 30 HST and 60 HST, the number of branches at the age of 30 HST and 60 HST. The results are presented in following Table 1.

Table 1
Summary results of analysis of various parameters of growth peanut plants

Variety Sources	Flowering Time	Plant Height 30 HST	Plant Height 60HST	Number of Leaves 30 HST	Number of Leaves 60 HST	Number of Branches 30 HST	Number of Branches 60 HST
Shade (N)	S	S	NS	S	S	S	S
Drought (K)	S	S	S	S	S	S	S
N x K	NS	NS	NS	S	S	S	S

Genotype (G)	S	NS	NS	NS	NS	S	S
N x G	NS	NS	NS	NS	NS	NS	NS
K x G	NS	NS	NS	NS	NS	NS	NS
N x K x G	NS	NS	NS	NS	NS	NS	NS

Description: S = Significant Difference; NS = No Significant Difference

The observed data, the results of analysis of variance and a further BNT test at a significant level of 5%, are presented in Appendix 1 to Appendix 7. Based on the analysis of the diversity of the parameters in Table 4.1, it can be seen that the variables at the time of flowering are significantly different in the treatments of shade, stress, and genotype on the level of 5%, but the treatment for adverse interactions shade, shade with genotype interactions, stress interaction with the genotype, and the interaction of these three factors in the treatments among shade, stress and genotyping was no significant difference at the 5% significance level.

For flowering time variable, the average treatments without shade (N0) is 25.47 HST and Shade (N1) is 28.85 HST; and after further tests with BNT, it showed a significant difference. This means that giving shade causes peanut plants during flowering to become slower. The average time of flowering on the treatment capacity of the Field (K0) is 27.43 HST and Drought Stress (K1) is 26.88 HST; and after further tests with BNT, it showed a significant difference. However, the treatment of drought stress during flowering seen peanut plants faster than the Field Capacity conditions. It means peanut crops more tolerant to drought stress conditions. The treatment of Genotype (G) on the analysis of the diversity of flowering time variables showed the significant difference; hence, to determine between genotypes (strains) which are significantly different, the researcher then did a comparison of double or a further test with BNT 5%. The results of the further test among genotypes for all variables in the growth phase are presented in Table 2.

Table 2
Results of the mean observation of the Genetic Parameters in Plant Growth of Peanut

Genotype (Strains)	Flowering time	Plant Height 30 HST	Plant Height 60 HST	Number of Leaves 30 HST	Number of Leaves 60 HST	Number of Branches 30 HST	Number of Branches 60 HST
G1	27,50 a	36,21 b	56,96 ab	18,33 b	36,42 b	2,88 d	3,54 b
G2	27,00 abc	41,33 ab	60,42 ab	20,46 ab	36,58 b	3,13 cd	3,46 b
G3	27,33 a	38,29 ab	49,00 b	21,63 ab	42,96 ab	3,92 abc	4,17 ab
G4	27,58 a	42,62 ab	61,67 a	23,54 a	41,42 ab	4,04 ab	4,13 ab
G5	27,08 abc	36,71 ab	53,17 ab	21,13 ab	41,29 ab	3,29 bcd	3,88 ab
G6	26,50 bc	41,75 ab	61,79 a	22,21 ab	48,08 a	4,50 a	4,54 a
G7	27,17 ab	38,58 ab	57,33 ab	21,88 ab	39,21 b	3,67 abcd	3,79 ab
G8	26,33 c	43,42 a	60,08 ab	24,54 a	42,00 ab	3,96 abc	4,17 ab
G9	27,50 a	38,00 ab	56,63 ab	21,42 ab	41,29 ab	3,92 abc	4,13 ab
G10	27,58 a	40,96 ab	52,79 ab	23,79 a	42,75 ab	4,08 ab	4,13 ab
BNT 5%	0,78	6,89	12,48	4,43	8,87	0,86	0,89

Description: The figures followed the same letters shows the results which do not differ significantly by a further test on the smallest significant difference (BNT)

According to table 2 between genotypes and BNT at 5% significant level, it can be seen that a variable time of flowering between genotypes of G1 (27.50 HST) are significantly different from the G6 (26.50 HST) and the G8 (26.33 HST), genotypes of G3 (27.33 HST) are significantly different from the G6 and G8, the genotypes of G4 (27.58 HST) are significantly different from the G6 and G8, the genotypes of G6 are significantly different from G9 (27.50 HST) and G10 (27.58 hst), the genotypes of G7 (27.17 HST) are significantly different from the G8. Among the G8 to G9 and G10 showed a significant difference at the 5% significance level; whereas the other multiple comparisons were not significantly different. Hence, the best treatment of G8 - the fastest time of flowering (26.33 HST) was significantly different from G4 and G10 - the longest flowering time (27.58 HST).

At the plant height variable at the age of 30 DAT, the factor of shade treatment and the stress showed significant difference at the 5% significance level, while treatment factors of the genotype and treatment interaction shade with stress, interaction auspices of the genotype, the interaction of stress with the genotype, and the interaction of these three treatment factors of shade, stress, and genotype showed there was no significant difference at the 5% significance level (see Table 1).

For plant height variable at the age of 30 HST, the average treatment Without Shade (N0) is 37.71 cm and Shade (N1) is 41.87 cm; and after further tests, with BNT it showed a significant difference. The average plant height at age 30 HST on the treatment of the Field Capacity (K0) is 42.10 cm and the Drought Stress (K1) is 37.48 cm, and after further tests, with BNT it showed a significant difference. The results of the further test by applying BNT at 5% that only between genotypes G1 (36.21 cm) and G8 (43.42 cm) showed a significant difference at 5% significance level while between other multiple comparisons, there was no a significant difference. Consequently, at the time the plant on the 30 days after planting, the best treatments of G8 which has the highest plant height (43.42 cm) and G1 having the lowest plant height (36,21cm) were significantly different.

At the variables of plant height at the age of 60 HST, treatment factor of stress showed significant difference on the level of 5%, while the factor of treatment of shade and the treatment of genotype and interaction shade with stress, interaction auspices of the genotype, the interaction of stress with the genotype, and the interaction of these three factors of treatment shade, stress and genotype showed no significant difference at the 5% significance level.

At variable of plant height at the age of 60 HST, the average treatment without shade (N0) is 56.16 cm and Shade (N1) is 57.81 cm and after having a further test with BNT it showed no significant difference. The average plant height at age 30 HST on the treatment of the Field Capacity (K0) is 60.08 cm and the Drought Stress (K1) is 53.89 cm after further tests with BNT which showed a significant difference. The results of the further test with BNT at 5% that genotype of G3 (49.00 cm), and G4 (61.67 cm) and G6 (61.79 cm) showed a significant difference at 5% significance level, meanwhile, the other double ratios do not have a significant difference. Therefore, the best treatment of G6 having the highest plant height (61.79 cm) was significantly different from G3 treatment having the lowest plant height (49.00 cm) at the time the plant age 60 days after planting.

At variable number of leaves at the age of 30 HST, a factor of treatment of shade, stress and interaction shade with stress showed significant difference at the 5% significance level, while on treatment factors genotype and interaction auspices of the genotype, the interaction of stress with the genotype, and the interaction of these three factors of treatment of shade, stress, and genotype showed no significant difference at the 5% significance level.

At a variable number of leaves at the age of 30 HST, the average treatment without shade (N0) is 30.27 strands and Shade (N1) is 13.52; and after a further test with BNT, it showed no significant difference. The average number of leaves at the age of 30 HST on the treatment of the Field Capacity (K0) is 24.03 strands and the Drought Stress (K1) is 19.76; however, after a further test with BNT, it showed a significant difference. Furthermore, the results of a further test by using BNT 5% found that among genotypes of G1 (18.33 piece) and G4 (23.54 strands), the G8 (24,54 strands), and G10 (23.79 pieces) showed significant difference at 5% significance level; whereas, other multiple comparisons were not significantly different. Thus, the best treatment G8, the highest number of leaves (24.54 pieces), was significantly different from G1, the least number of leaves (18.33 pieces) at the time the plant age 60 days after planting.

At the variable number of leaves at the age of 60 HST, the factor of the treatment of shade, stress and treatment interaction shade with stress showed significant difference at the 5% significance level, while on treatment factors of genotype and interaction auspices of the genotype, the interaction of stress with the genotype, and the interaction of these three factors shade treatment, stress and genotype showed no significant difference at the 5% significance level.

At the variable number of leaves at the age of 60 HST, the average treatment without shade (N0) is 65.13 strands and Shade (N1) is 17.28 strands and after a further test with BNT, it showed no significant difference. The average number of leaves at the age of 60 HST treatment of the Field Capacity (K0) is 45.76 strands and the Drought Stress (K1) is 36.64 strands after the further test with BNT, it showed a significant difference. The results of further test by using BNT 5% found that there is a significant difference among the genotypes of G1 (36.42 pieces) and G6 (48.08 pieces), and between the G2 (36.58 piece) and G6 (48.08 piece) with G6 showing significant difference at 5% significance level, while there were no significant difference inter-double comparisons. Thus, the best treatment G6 having the highest number of leaves (48.08 pieces) was significantly different from the treatment of the G1 having the least number of leaves (36.42 pieces) at the time the plant age 60 days after planting.

At the variable number of branches at the age of 30 HST, the factor of the treatment of shade, stress, and treatment interaction shade with stress, as well as factor in the treatment of the genotypes showed significant difference at the 5% significance level, while the interaction auspices of the genotype, the interaction of stress with the genotype, and the interaction of these three factors shade treatment, stress and genotype showed no significant difference at the 5% significance level.

At a variable number of branches at the age of 30 HST, the treatment mean Without Shade (N0) is 5.92 branches and Shade (N1) of 1.56 branches it shows a significant difference after having a further test with BNT. The average number of branches at the age of 30 HST on the treatment of the Field Capacity (K0) is 4.16 branches and the Drought Stress (K1) is 3.32 branches after a further test with BNT showing a significant difference. The results of the further test by applying BNT 5% found that genotypes of G1 (2,88 branches) are significantly different from the G3 (3.92 branches), G4 (4.04 branch), G6 (4.50 branch), G8 (3.96 branches), G9 (3.92 branches), and G10 (4,08 branches), and also genotypes of G2 (3,13 branches) are significantly different at the 5% significance level from the G4, G6, G10, and the G5 (3,29 branches), meanwhile the other double comparisons were not significantly different. Therefore, the best treatment of G6 having the highest number of branches (4,50 branches) is significantly different from the treatment of genotype 1 having the least number of branches (2,88 branches) at the time the plant age 60 days after planting.

At the variable number of branches at the age of 60 HST, the treatment factor of shade, stress, and treatment interaction shade with stress, as well as the treatment factor of genotypes showed significant difference at the 5% significance level, while the interaction auspices of the genotype, the interaction of stress with the genotype, and the interaction of these three treatment factors showed no significant difference at the 5% significance level.

At the variable number of branches at the age of 60 HST, the average of the treatment without shade (N0) is 6.32 branches and Shade (N1) is 1.67 branches and it shows a significant difference after having a further test with BNT. The average number of branches on the treatment of the Field Capacity (K0) is 4.48 branches and the Drought Stress (K1) is 3.50 branches and after a further test with BNT, it showed a significant difference. The results of the further test by BNT 5% found the genotypes of G1 (3.54 branch) were significantly different from the G6 (4.54 branch), and the genotypes of the G2 (3.46 branch) and G6 showed significant difference at 5% significance level; whereas the other multiple comparisons were not significantly different. Thus, the best treatment of G6 having the highest number of branches (4,54 branches) was significantly different from G2 treatment having the fewest number of branches (3,46 branches) at the time the plant age 60 days after planting.

3.2 Effect of Shade on the Formation of Chlorophyll

The results of measurements of chlorophyll in the leaves of peanut plants of various treatments, chlorophyll A and B as well as the total chlorophyll are presented in Table 3 - 6. The results of measurements of chlorophyll A are presented in Table 3 below.

Table 3
The results of measurements of chlorophyll A of the Peanut Leaves

Genotype	K0N0	K0N1	K1N0	K1N1	Total	Mean-score
G1	19.730	16.593	14.486	18.037	68.846	17.211
G2	16.796	14.810	16.732	17.871	66.208	16.552
G3	16.125	14.209	17.018	16.243	63.593	15.898
G4	17.197	15.149	17.568	15.663	65.577	16.394
G5	16.724	16.603	19.726	17.285	70.337	17.584
G6	16.487	14.225	18.026	16.929	65.668	16.417
G7	16.044	13.632	16.369	16.893	62.938	15.735
G8	18.100	18.138	18.231	17.903	72.371	18.093
G9	15.787	14.208	15.744	15.945	61.684	15.421
G10	15.296	13.033	17.485	17.862	63.676	15.919
Total	168.285	150.599	171.384	170.630	660.898	165.224
Mean score	16.829	15.060	17.138	17.063	66.090	16.522

Based on the data in Table 3 above, it can be seen chlorophyll A, on average, is the largest in a genotype G8 (18.093) and the smallest one in the genotype G9 (15.421). However, if it is viewed from each treatment for the condition of field capacity with no shade (K0N0) chlorophyll is A the highest in genotype G1 (19.730) and the lowest for the genotypes G10 (15.296). For the treatment of field capacity with shade (K0N1), chlorophyll A is the highest in the genotype G8 (18.138) and the lowest for the genotypes G10 (13.033), and for the treatment of drought stress with without shade (K1N0), chlorophyll A is the highest in the genotype G5 (19.726) and the lowest for the genotypes G1 (14.486). Furthermore, for the treatment of drought stress with shade (K1N1) chlorophyll A is highest in genotype G1 (18.037) and the lowest for the genotype G9 (15.945). The results of measurements of chlorophyll B is presented in Table 4 below.

Table 4
The results of measurements of chlorophyll B of the Peanut Leaves

Genotype	K0N0	K0N1	K1N0	K1N1	Total	Average
G1	8.877	8.810	6.517	8.186	32.390	8.097
G2	7.085	7.957	7.398	8.243	30.684	7.671
G3	7.221	7.716	7.696	7.712	30.344	7.586
G4	7.033	8.256	8.163	7.478	30.930	7.733
G5	7.107	8.061	9.012	8.254	32.434	8.109
G6	6.487	7.061	8.433	7.770	29.751	7.438
G7	6.770	7.094	7.474	8.323	29.661	7.415
G8	7.979	9.237	8.612	8.518	34.345	8.586
G9	6.576	7.612	7.308	7.769	29.265	7.316
G10	6.640	6.718	7.668	8.352	29.377	7.344
Total	71.773	78.522	78.280	80.604	309.179	77.295
Average	7.177	7.852	7.828	8.060	30.918	7.729

Based on Table 4 above, it can be seen the chlorophyll B is the largest average on genotype G8 (8.586) and the smallest genotype G9 (7.316), but when it is viewed from each treatment for the condition of the field capacity without shade (K0N0), the chlorophyll B is the highest in genotype G1 (8.877) and the lowest for the genotype G6 (6.487). If the view is from the treatment of field capacity with shade (K0N1), chlorophyll B is highest in genotype G8 (9.237) and the lowest in the genotypes G10 (6.718); and for the treatment of drought stress with without shade (K1N0), chlorophyll B is highest in genotype G5 (9.012) and the lowest in the genotypes G1 (6.517). Furthermore, for the treatment of drought stress with shade (K1N1), chlorophyll B is the highest in genotype G8 (8.518) and the lowest for the genotype G4 (7.478).

The results of the measurement of total chlorophyll - a combination of the value of chlorophyll A and B, are presented in Table 5 below.

Table 5
The results of the measurement of total chlorophyll of the peanut leaves

Genotype	K0N0	K0N1	K1N0	K1N1	Total	Average
G1	28.607	25.403	21.003	26.223	101.235	25.309
G2	23.881	22.767	24.130	26.114	96.892	24.223
G3	23.345	21.924	24.713	23.954	93.937	23.484
G4	24.230	23.406	25.730	23.141	96.507	24.127
G5	23.831	24.663	28.738	25.539	102.771	25.693
G6	22.974	21.286	26.459	24.699	95.419	23.855
G7	22.814	20.726	23.843	25.216	92.599	23.150
G8	26.079	27.375	26.842	26.421	106.716	26.679
G9	22.363	21.820	23.053	23.713	90.948	22.737
G10	21.936	19.751	25.153	26.214	93.053	23.263
Total	240.058	229.121	249.664	251.234	970.077	242.519

Average	24.006	22.912	24.966	25.123	97.008	24.252

Based on Table 5 above, it can be seen that the total chlorophyll, on average, the largest is in genotype G8 (26.679) and the smallest is the genotype G9 (22.737). Yet, when it is viewed from each treatment for the condition of field capacity with no shade (K0N0) total chlorophyll, the highest genotype is G1 (28.607) and the lowest genotype is G10 (21.936). For another treatment of field capacity with shade (K0N1), the highest total of the chlorophyll is in genotype G8 (27.375) and the lowest in the genotype G6 (21.286); and for the other treatment of drought stress with without shade (K1N0), the highest total of the chlorophyll is in genotype G5 (28.738) and the lowest in the genotypes G1 (21.003). Lastly, for the treatment of drought stress with shade (K1N1), the highest total of the chlorophyll is in genotype G8 (26.421) and the lowest in the genotype G4 (23.141).

3.3 Peanut Crop Production

The parameters observed in the phase of production of peanut plants is the total number of pods per plant, number of pods containing, by weight stover wet and dry stover weight. The results are presented in Table 6 below.

Table 6
Summary of analysis results of the parameter production peanut plant diversity

Factor	Total of Pods	Contained Pods	Heavy-wet	Heavy-dry
Shade (N)	S	S	S	S
Drought (K)	NS	NS	NS	NS
N x K	S	S	S	S
Genotype (G)	NS	NS	NS	NS
N x G	NS	NS	NS	NS
K x G	NS	NS	NS	NS
N x K x G	NS	NS	NS	NS

Description: S = Significant Difference; NS = No significant Difference

Data of the results of analysis of variance and a further test BNT 5% are presented in Appendix 8 to 11. Based on the analysis parameters of the variance on Tabel4.7, it can be seen that the variable number of total pods at harvest on the treatment of shade and the treatment interactions with shade showed a significant difference on the level of 5%. Meanwhile, in the treatment of stress factors, treatment of genotype and genotype interactions with the shade, stress interaction with the genotype, and the interaction of these three treatment factors of shade, stress, and genotype showed no significant difference at the 5% significance level.

For a variable number of pods, the total average treatment without shade (N0) is 9.14 pods and Shade (N1) is 3,01 pod, and after further test with BNT, it showed a significant difference. The average number of pods on the total treatment capacity of the Field (K0) is 6.33 pods and the Drought Stress (K1) is as much as 5.83 pods and after further test with BNT, it showed no significant difference.

The results of a further test by BNT 5% among genotypes for all variables in the production phase is presented in Table 7.

Table 7
The results of the mean score on genotype parameter observation on the peanut plant production phase

Genotype	Total of Pods	Pods-containing	Weight-fresh	Weight-dry
G1	5,42 b	4,75 b	10,88 a	6,13 a
G2	6,04 ab	5,21 ab	11,67 a	6,46 a
G3	5,25 b	4,67 b	10,96 a	6,92 a
G4	5,08 b	4,58 b	9,63 a	5,96 a
G5	6,13 ab	4,92 ab	10,08 a	5,42 a
G6	6,50 ab	5,46 ab	11,21 a	5,50 a
G7	5,67 ab	4,21 b	11,17 a	5,96 a

G8	6,83 ab	6,08 ab	11,00 a	6,13 a
G9	6,04 ab	5,54 ab	12,17 a	6,67 a
G10	7,79 a	7,00 a	11,54 a	6,50 a
BNT 5%	2,31	2,11	4,25	2,77

Description: the numbers followed by the same letters showed no significant difference based on a further test on the smallest significant difference.

Results of further tests on total number of pods with BNT 5% found there is significant difference at the level of 5% significant level between the genotypes G1 (5.42 pods) and the genotypes G10 (7.79 pods), between the genotypes G3 (5.25 pods) and the genotypes G10, and between the genotypes G4 (5, 08 pods) and G10. While the other multiple comparisons were not significantly different. Hence, the best treatment G10 which has a highest total number of pods (7.79 pods) showed significantly different from G4 treatment which has the least number of total pods (5.08 pods) at the time of planting crops.

At the variable number of pods-contain at the harvest time, the factor of the treatment of shade and the treatment of interaction shade with stress showed a significant difference at the 5% significance level, while on treatment factors of stress, treatment of genotype and interaction auspices of the genotype, the interaction of stress with the genotype, and the interaction of these three factors shade treatment, stress and genotype showed no significant difference at the 5% significance level.

For a variable number of pods-contain, an average treatment without shade (N0) is 7.92 pods and Shade (N1) is 2.57 pods and after a further test with BNT, it showed a significant difference. The average number of pods contain the treatment capacity of the Field (K0) is 5.74 pods and the Drought Stress (K1) is 4.74 pods, and after a further test with BNT, it showed no significant difference.

The further test results by using BNT 5% found that there were significant differences at 5% significance level between genotypes G1 (4.75 pods) and the genotypes G10 (7.00 pods), the genotypes G3 (4.67 pods) and the genotypes G10, the genotypes G4 (4.58 pods) and genotypes G10, and the G7 (4.21 pods) and G10. While among the other multiple comparisons, there were not significantly different. Therefore, the best treatment G10 - the highest number of pods contain (7.00 pods) was significantly different from the treatment of G7- the least number of pods contain (4.21 pods) at the time of planting crops.

At the variable weight-fresh stover at harvest time, the factor of the treatment of shade and treatment of interaction shade with stress showed significant difference at the 5% significance level, while on treatment factors stress, treatment of genotype and interaction auspices of the genotype, the interaction of stress with the genotype, and the interaction of these three treatment factors of shade, stress, and genotype showed no significant difference at the 5% significance level.

For variable weight-fresh stover, the average of the treatment is 16.38 grams for sunshade (N0) and 5.68 gram for Shade (N1), and after having the further tests with BNT, it showed significant differences. The average weight of the fresh stover treatment of the Field Capacity (K0) is 11.68 grams and the Drought Stress (K1) is 10.38 grams; and after having a further test with BNT, it showed no significant difference. The further test results on the double comparison with BNT 5% showed that none significantly different among the genotypes.

At the variable dry weight stover at the harvest time, the factor of treatment of shade and treatment interaction shade with stress showed significant difference at the 5% significance level, while on treatment factors stress, treatment of genotype and interaction auspices of the genotype, the interaction of stress with the genotype, and the interaction of these three treatment factors of shade, stress, and genotype showed no significant difference real of 5%.

At the variable dry weight stover, the average of the treatment is 9.13 grams for sunshade (N0) and is 3.20 gram for shade (N1); and after having a further test with BNT, it showed a significant difference. The average weight of dry stover in the treatment of the Field Capacity (K0) is 6.57 grams and the Drought Stress (K1) is 5.76 gram; and after having a further test with BNT, it showed no significant difference. The further test results on double comparison with BNT 5% showed none significantly different among the genotypes.

 ISSN: 2454-2261

4. Conclusion

Based on the analysis of the variances and the discussion above, it showed that shade and unshade gives a significant influence on the parameters of the growth and the production phase i.e. the total number of pods, pods contain fresh-weight stover, and dry weight stover at the harvest. Treatment of the genotypes providing the best results in the growth phase for all of the parameters are strains 6 (G6) and strains 8 (G8), and the best productive phase is strain 10 (G10) for the parameter number of the pods total and the number of pods containing, fresh-weight stover and dry weight stover have no significant difference.

Conflict of interest statement and funding sources
The author(s) declared that (s)he/they have no competing interest. The study was financed by the authors.

Statement of authorship
The author(s) have a responsibility for the conception and design of the study. The author(s) have approved the final article.

Acknowledgments
We thanks to our Lecture and agricultural officers for sharing information, and other for critiques and suggestions for improving this paper.

References

Collino, D. J., Dardanelli, J. L., Sereno, R., & Racca, R. W. (2000). Physiological responses of argentine peanut varieties to water stress. Water uptake and water use efficiency. *Field Crops Research*, *68*(2), 133-142. https://doi.org/10.1016/S0378-4290(00)00115-5

Djazuli, M. (2016). Pengaruh cekaman kekeringan terhadap pertumbuhan dan beberapa karakter morfo-fisiologis tanaman nilam. *Buletin Penelitian Tanaman Rempah dan Obat*, *21*(1), 8-17.

Hemon, A. F., & Hanafi, A. B. (2012). Sumarjan. 2012-2016. *Seleksi dan uji adaptasi galur hasil induksi mutasi dengan iradiasi sinar gamma pada penanaman di lahan sawah dan tegalan untuk mendapatkan kultivar kacang tanah toleran cekaman kekeringan dan berdaya hasil tinggi. Penelitian Hibah Bersaing*, *2016*.

Hemon, F. (2018). Pertumbuhan tanaman kacang tanah hasil seleksi in vitro Pada media polietilena glikol terhadap cekaman Larutan polietilena glikol. *CROP AGRO, Scientific Journal of Agronomy*, *2*(1), 1-7.

Kasno, A. (2007). Strategi pengembangan Kacang tanah di Indonesia. Peningkatan Produksi Kacangkacangan dan Umbi-umbian Mendukung Kemandirian Pangan.

Kasno, A., Saleh, N., & Ginting, E. (1996). Pengembangan pangan berbasis kacang-kacangan dan umbi-umbian guna pemantapan ketahanan pangan nasional. *Sumber*, *1999*(2002), 2003.

Pangan, D. P. T., & Kartanegara, H. K. K. (2010). Laporan Tahunan 2010. *Dinas Pertanian Tanaman Pangan, Pemerintah Provinsi Jawa Barat*.

Statistik, B. P. (1995). Statistical yearbook of Indonesia. *Badan Pusat Statistik, Jakarta, Indonesia*.

Sundari, T., Soemartono, T., & Mangoendidjojo, W. (2005). Keragaan Hasil Dan Toleransi Genotipe Kacang Bijau Terhadap Penaungan. *Ilmu Pertanian*, *12*(2005).

Suprapto, B. (2002). Effect of low-dosage vitamin A and riboflavin on iron-folate supplementation in anaemic pregnant women. *Asia Pacific journal of clinical nutrition*, *11*(4), 263-267. https://doi.org/10.1046/j.1440-6047.2002.00310.x

Suprapto, M. (2008). Pemodelan Pengelolaan Aliran Rendah Dengan Pendekatan Hidrologi Elementer. *Disertasi Pascasarjana Fakultas Teknik UGM, Jogjakarta*.

Surya, B. S. L. R. B., Raja, L. R. B. S. L., Damanik, B. S. J., & Ginting, J. (2013). Respons pertumbuhan dan produksi kacang tanah terhadap bahan organik Tithonia diversifolia dan pupuk SP-36. *AGROEKOTEKNOLOGI*, *1*(3).

Biography of Authors

Ida Wahyuni adheres a Master Program of Arid Land Resource Management at the University of Mataram
Email: idawahyuni@gmail.com

Variasi Somaklonal Tanaman Kacang Tanah Hasil Regenerasi dari Embrio Somatik yang Berbeda Umur Kulturnya.
Tipe Varian Somaklonal Populasi Tanaman Kacang Tanah Hasil Seleksi In Vitro Berulang dan Seleksi Ganda
Variasi somaklonal tanaman kacang tanah hasil regenerasi dari embrio somatik yang berbeda
Pertumbuhan tanaman kacang tanah hasil seleksi in vitro pada media polietilena glikol terhadap cekaman larutan polietilena glikol.
Efektivitas polietilena glikol dan manitol sebagai agens penyeleksi in vitro untuk cekaman kekeringan terhadap pertumbuhan embrio somatik kacang tanah.
Ketahanan sejumlah galur kacang tanah hasil regenerasi enbrio somatik terhadap infeksi Sclerotium rolfsii.
Induksi mutasi dengan iradiasi sinar Gamma dan seleksi in vitro untuk indentifikasi embrio somatik kacang tanah cv. Local Bima yang toleran terhadap media polietilena glikol.
Efektivitas filtrat kultur dan identifikasi embrio somatik dan kecambah kacang tanah kultivar Lokal Bima Pada filtrat kultur cendawan Fusarium sp.
Ketahanan beberapa galur kacang tanah hasil kultur In vitro terhadap penyakit layu cendawan Fusarium sp.
Uji daya hasil beberapa galur mutan kacang tanah hasil iradiasi sinar gamma
Uji Toleransi galur Kacang Tanah Hasil Iradiasi Sinar gamma terhadap Larutan Polietilen Glikol
Variasi genetik beberapa sifat kuantitatif tanaman kacang tanah Lokal bima hasil iradiasi sinar gamma
Pengaruh intensitas penyiangan terhadap pertumbuhan dan hasil beberapa galur kacang Tanah di lahan kering Kabupaten Dompu
Pertumbuhan dan hasil kacang tanah yang diberi Rhizobium pada cekaman kekeringan

Kisman, Khumaida, N., Trikoesoemaningtyas, Sobir, Sopandie, D. **2006a**. Analisis Ekspresi Gen-gen yang terkait "Shade Avoidance" pada Kedelai Toleran Naungan. **Agroteksos, Vol. 16.3: 161-168**
Kisman, Khumaida, N., Trikoesoemaningtyas, Sobir, Sopandie, D. **2007**. Karakter Morfo-fisiologi Daun, Penciri Adaptasi Kedelai terhadap Intensitas Cahaya Rendah. **Buletin Agronomi, vol. XXXV.2:96-102**.
Kisman, Trikoesoemaningtyas, Sobir, N. Khumaida, D. Sopandi. **2008**. Pola Pewarisan Adaptasi Kedelai (*Glycine Max* L. Merrill) terhadap Cekaman Naungan Berdasarkan Karakter Morfo-Fisologi Daun. **Buletin Agronomi 36 (1): 1-7**
Kisman. 2008. Pendugaan Jumlah dan Aksi Gen Pengendali Karakter Morfo-fisiologi Daun yang Terkait Adaptasi Kedelai terhadap Cekaman Naungan. **Crop Agro, Vol. 1.1:9-17**
Kisman. 2008. Pola Pertumbuhan Awal Tanaman Kedelai Pada Kondisi Cekaman Intensitas Cahaya Rendah Dan Pemberian Inhibitor Plastida (Uji Cepat Toleransi Kedelai Terhadap Cekaman Naungan). **Crop Agro, Vol. 1 No. 2, 85-91**
Khumaida, N., **Kisman**, D. Sopandie. 2008. Karakterisasi Sekuen Lengkap *JJ3* Yang Diisolasi Dari Kedelai Toleran Naungan. Buletin Agronomi 36 (2): 118-127
Butler, J.R.A., W. Suadnya, K. Puspadi, Y. Sutaryono, R.M. Wise, T.D. Skewes, D. Kirono, E.L. Bohensky, T. Handayani, P. Habibi, **M. Kisman**, I. Suharto, Hanartani, S. Supartarningsih, A. Ripaldi, A. Fachry, Y. Yanuartati, G. Abbas, K. Dugganm, A. Ash, (2014). Framing the application of adaptation pathways for rural livelihoods and global change in eastern Indonesian islands, *in* Global Environmental Change. Published by Elsevier Ltd. 28 (2014) 368–382
Nurul Khumaida, **Kisman** dan Didy Sopandie, (2008). Karakterisasi Sekuen Lengkap *JJ3* yang Diisolasi dari Kedelai Toleran Naungan. *Characterization of Full Length Sequence of JJ3 Isolated from Shade Tolerant Soybean*. Bul. Agron. (36) (2) 118 – 125