Vol. 18 · October 2014
Print ISSN 2012-3981 • Online ISSN 2244-0445
doi: http://dx.doi.org/10.7719/jpair.v18i1.295
Journal Impact: H Index = 3 from Publish or Perish

JPAIR Multidisciplinary Research is produced
by PAIR, an ISO 9001:2008 QMS certified
by AJA Registrars, Inc.

# Dry Matter Partitioning of Bunch and Runner Type Peanut in Relation to Levels and Methods of Paclobutrazol Application

**MARY GRACE B. GATAN**
http://orcid.org/0000-0002-6083-0060
mbgatan.mbgb@gmail.com
Pampanga Agricultural College
Magalang, Pampanga

**VIRGILIO DM. GONZALES**
http://orcid.org/0000-0002-7476-4703
virgon3000@gmail.com
Pampanga Agricultural College
Magalang, Pampanga

## ABSTRACT

Peanut (*Arachis hypogea*) is a protein-rich and oil-laden food legume. Farmers in the region commonly grow peanut at dry season because during the wet season, upper part of peanut is prioritized instead of pod formation resulting to low yield. One way of increasing yield is suppression of shoot growth through paclobutrazol application. The exrperiment was conducted in Pampanga, Philippines following three-factor factorial Randomized Complete Block Design to determine dry matter partitioning of different types of peanut relative to levels and methods of paclobutrazol application. Each treatment was replicated thrice.

Data were analyzed under Analysis of Variance and Honest Significant Difference test was used to compare treatment means. Results reveal that paclobutrazol levels reduced stem length of runner and bunch by 36.37% and 65.64% one month after application. Likewise, paclobutrazol levels reduced leaf and stem dry mass of the runner by 20.94% and 19.87%, respectively. Runner with 75mg/L paclobutrazol obtained 58.09% increase in harvest index. The crop growth rate and distribution index of runner increased by 20.72% and 32.56% across levels and methods of paclobutrazol application. Increasing level of paclobutrazol increased total pod dry mass of runner by 26.29%.

***Keywords*** **-** Agriculture, dry matter partitioning, *Arachis hypogaea*, Paclobutrazol, experimental, Philippines

## INTRODUCTION

About 95% of the peanut areas in the country are planting low yielding bunch type variety during dry season. Farmers are concern in finding means on how to increase their production particularly at wet season. Peanut can be classified as runner or bunch type. The runner peanut type is characterized by prostrate stems and branches, late maturity and large pods and seeds produced along the leaf axils of prostrate, side branches above the ground. On the other hand, bunch type of peanut has upright stems, early maturity and small pods and seeds produced mainly in the nodes below the ground (Palomar, 1998). At present, plant growth retardants are applied to reduce unwanted shoot growth without lowering plant productivity (Rademacher, 2000). These plant growth regulators play a role in many physiological processes associated with growth and development of plants (Thakur & Thakur, 1993). Paclobutrazol, a triazole compound are mainly used as growth retardants and also stress protectants in many crop plants (Fletcher et al., 2000). The effects of triazoles on hormonal changes, photosynthetic rate, enzyme activities and yield components were reported by Zhou and Ye (1996).

In 2011, Tang et al., stated that paclobutrazol treatment reduced pod number, productivity per plant and yield of peanut relative to the control. Paclobutrazol also reduced the plant height and lateral branch of peanut while increasing the number of branches and number of pod per plant, rate of filled pod and oil content of seed. Moreover, peanut applied with paclobutrazol resulted to the reduction of stem length. While the dry matter of pods, the economic index, the sink size/source, number of pods per plant and the pod weight per plant were

increased (Chen et al., 2010)

Paclobutrazol at 150 mg/L applied at blossoming stage inhibited the growth of the main stems and branches but the number of pods per plant and percentage of filled pods were increased resulting to increase in yield (Yu et al., 2009).

The application of paclobutrazol at blooming stage of peanut inhibited the height of plant, increase stem diameter, promote the pod filling percentage, hence increased the yield and income. The optimum amount of paclobutrazol was 500g/$m^{-2}$ (Liang et al., 1995).

Zheng (2008) reported that 15% paclobutrazol could effectively inhibit the growth of peanut plants and promote more pods and mature pods leading to high yield. The 15% paclobutrazol effectively controlled the growth of above-ground part of peanut plants and led to the highest yield.

Peanut seed treated with paclobutrazol with a concentration of 50mg/kg and 100mg/kg respectively, can make the root volume of peanut plant increase by 91.43% and 31.93%, and make the total root surface areas increase of 41.45% and 31.93%, respectively. The spray concentration of 100mg/kg of water can make the main stem shorten and make the branches shorten of 13.2 cm. The spray concentration of 50 mg/kg can produce high pod yield (4518 kg/$m^{-2}$), compared with 3756 kg/$m^{-2}$ in CK (Tao et al., 2000).

During wet season planting, upper part of peanut is prioritized at the expense of pod formation resulting to low yield. One feasible way of increasing pod yield is the suppression of shoot growth through paclobutrazol application to enhance photosynthate partitioning to subterrranean peanut pods. However, literature is meager as regards to differences in dry matter partitioning between runner and bunch type relative to paclobutrazol application. In addition, this study will be of great help to our peanut growers to increase their yield and will give them encouragement to plant even wet season, hence this study was conducted.

## OBJECTIVES OF THE STUDY

This experiment was conducted to determine the effect of different levels and methods of paclobutrazol to different types of peanut. Specifically, it aimed to determine the monthly changes in stem length, leaf dry mass, and stem dry mass; dry matter partitioning, crop growth rate, pod growth rate, distribution index; total dry mass and harvest index.

## MATERIALS AND METHODS

The study was conducted during the wet season planting of peanut, June to October 2013 in Pampanga, Philippines.

### Experimental Crop

The varieties of peanut that were used represented the two types, runner and bunch.

**Runner (Asha)** – this variety was developed by ICRISAT. The seed yield averaged 3.0-3.5t/ha and is harvested 121-122 days after planting. Its plant height ranged from 55.9-74.15cm with a shelling percentage of 71.9% during wet season and 74.2% at dry season. The weight of 100 seeds is 71.9-74.2g. It is large seeded variety with pink seed color.

**Bunch (Farmers' Variety)** – this variety was developed by BPI. Days to flower is from 23-20 days after planting, and its plant height ranged from 41-64cm. The seed yield averaged 1.0-1.5 t/ha. It is harvested 80-90 days after planting depending on the season. It is small seeded variety, having three seeds per pod with red seed color.

### Experimental Design and Treatments

The experimental area was laid out following the procedure in three-factor factorial Randomized Complete Block Design (RCBD) factor-factorial. Each treatment combination was replicated three times. The following were the three factors involved in the study.

**Factor A (Type of Peanut)**

$T_1$ – runner type (Asha)
$T_2$ – bunch type (Farmers variety)

**Factor B (Levels of Paclobutrazol, PBZ)**

$L_1$ – Control (pure water)
$L_2$ – 75mg PBZ per Liter of water
$L_3$ – 150mg PBZ per Liter of water
$L_4$ – 225mg PBZ per Liter of water

**Factor C (Method of Application)**
$A_1$ – Foliar
$A_2$ – Drench

**Experimental Area**

A total area of 646$m^2$ was used in conducting the experiment. The area accommodated the 16 treatment combinations including the border plants. Each plot measures 2m in width and 5m in length comprising of four rows spaced 0.5 m apart. An alleyway of one meter between replications was provided for ease in placing stakes, plot tags, data gathering, weeding and harvesting. Border ridge was provided to prevent seepage in case rains occur after paclobutrazol application.

**Land Preparation**

The area was thoroughly prepared by plowing two times alternately followed by two harrowing to obtain fine tilth that is essential to achieve good germination. After the final harrowing, the field was furrowed at a distance of 50cm.

**Soil sample collection and analysis**

Soil samples were collected before the conduct of the experiment as basis of fertilizer application. The soil samples were pulverized; air dried and mix thoroughly to make a composite soil sample and this was brought to the Soils Laboratory at San Fernando, Pampanga for soil analysis.

**Fertilizer Application**

As recommended in the result of soil analysis, Calcium nitrate at the rate of 0.645g/hill which is equivalent to 12.9g/$m^2$or 8.3kg for the whole area was applied basally. In addition to Calcium nitrate, 32.3kg of organic fertilizer was also applied for the 646$m^2$ or 50g/$m^2$.Both organic fertilizer and Calcium nitrate were applied uniformly along the rows and was covered with 2-3 cm layer of soil prior to planting.

**Inoculation**

Peanut seeds were inoculated with Rhizobium at the rate of 100g/50kg of seeds. This was done by coating the seeds with inoculant using water at least two hours before planting.

**Planting and Thinning**

Planting was done by sowing two seeds per hill. Thinning was done 10 days after planting. A total of 10 plants were maintained per linear meter. The distance between hills is 10cm and 50cm between furrows. The plant population density was 20 plants/$m^2$.

**Irrigation**

Irrigation was done immediately after sowing. Generally, peanut needs water critically during flowering and podding stages. Irrigation was done three times throughout the experimental period. During these stages, the soil is too dry, and plants show signs of wilting.

**Cultivation and Weeding**

Hilling-up was done only during flowering stage to cover the shallow pegs. In addition, weeding was done manually and regularly until flowering stage.

**Application of Paclobutrazol**

Paclobutrazol was applied using two methods namely, foliar and drenching application following the different levels specified in the treatment. The solution was sprayed to the plants during the peak of flowering which is about 30-40 days after planting for the Asha variety and 25-30 days after planting for the farmers' variety.

**Destructive Sampling and Drying**

Destructive sampling was carried in four occasions at 30, 60, 90 and 120 days after planting in runner (Asha) and 30, 60 and 90 in the Farmers' variety. Ten sample plants were harvested per plot. All plant samples were separated into stems, leaves and pod components. Component plant parts were sun-dried. Once dried, the data on dry matter yield components was collected and recorded.

**Data Collection, Computation and Analysis**

1. Stem Length (cm). This is the distance from the ground level to the tip of the main stem of plant samples selected at random from each plot at 30,60, and 120 days after planting.

2. Dry Mass of Leaves, Stem and Pods

    a. Leaf dry mass was weighed for four occasions such as 30, 60, 90 and

120DAP

b. Stem dry mass was weighed for four occasions at 30, 60, 90 and 120DAP

c. Pod dry mass was weighed for two occasions at 60 and 120DAP for runner (Asha) and 60 and 90DAP for bunch (farmer's variety). Pods refer to the immature and mature fruits, including the swelled ovary tip at least twice the peg diameter to the fully expanded, immature and mature fruits.

3. Crop growth rate (CGR). This was measured using the formula below:

$$CGR = \frac{TDMt_2 - TDMt_1}{t_2 - t_1}$$

where $TDMt_2$ = total dry mass at harvest (120DAP for Asha and 90DAP for farmers' variety)
$TDMt_1$ = total dry mass at 60DAP (both for Runner and Bunch)
$t_2$ = number of days at harvest
$t_1$ = 60DAP (both for Asha and Farmers' variety)

4. Pod growth rate (PGR). This was computed using the formula as follows:

$$PGR = \frac{PDMt_2 - PDMt_1}{t_2 - t_1}$$

where $PDMt_2$ = pod dry mass at harvest (120DAP for Asha and 90DAP for farmers' variety)
$PDMt_1$ = pod dry mass at 60DAP (both for Asha and farmers' variety)
$t_2$ = number of days at harvest
$t_1$ = 60DAP (both for Asha and farmers' variety)

5. Distribution index. It was measured by dividing the organ growth rate by crop growth rate simply as:

$$DI = \frac{OGR}{CGR}$$

where OGR = organ growth rate (pods)
CGR = crop growth rate

6. Harvest index. This was computed by simply separating the biological ($Y_b$) and the economic yield ($Y_e$) of the sample plants. This was determined using this formula:

$$HI = \frac{Y_e}{Y_b}$$

where $Y_e$ = economic yield (fruits/pods)
$Y_b$ = biological yield (leaves and stem)

**Statistical Analysis**

All collected data were subjected to statistical analysis under Analysis of Variance (ANOVA) using a statistical tool for Agricultural research (STAR) software. Honest Significant Difference (HSD) test was used to compare treatment means.

## RESULTS AND DISCUSSION

### Vegetative Growth

**Stem Length**

Variation as to the type of peanut in terms of stem length was recorded (Figures 1 and 2). Farmers' variety obtained the longest stem length throughout the experimental period (30 to 90DAP) compared to Asha.

Untreated plants continuously obtained the longest length throughout the study period. No significant difference was noted among levels of PBZ prior to application (30DAP). The inhibitory effect of paclobutrazol on stem length of the two varieties could only be observed commencing at 60DAP where a corresponding reduction in stem length was attained as the level of paclobutrazol increases (Figures 3, 4 and 5). This may be due to the constant number of the nodes, and the length of the internodes are shortened particularly at the base of the plant which could be beneficial for the peg to penetrate into the soil. The findings confirm with the report of Chen et al. (2010) that paclobutrazol application resulted to reduction of stem length in peanut.

Methods of paclobutrazol application exhibited significant variation in Asha at 120DAP only where drench application considerably decreased stem length (Figures 6 and 7). The result confirms with the statement of Hampton and

Hebblethwaitez (1985) that drench application was more effective in inhibiting stem length than foliar spray simply because drench method indicates that the chemical is readily translocated in the xylem.

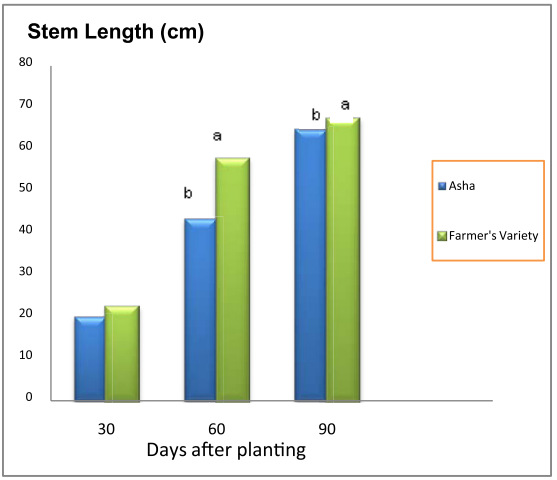


Figure 1. Stem length of runner (asha) and bunch (farmers' variety) type of peanut across levels and method of paclobutrazol application

*Means within the column followed by a common letter is not significantly different at 5% HSD level.


Figure 2. The two varieties used in the study at harvest

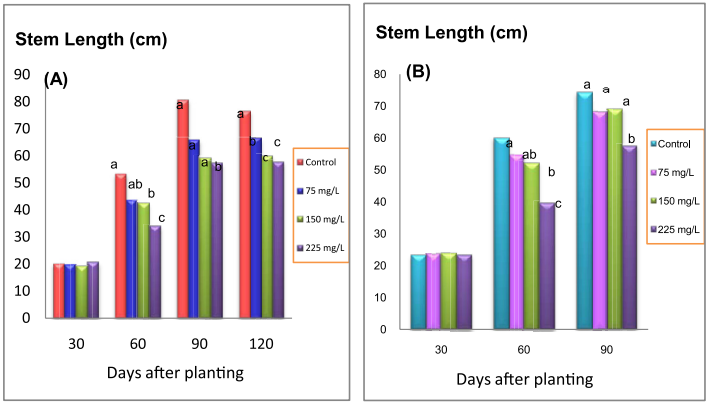


Figure 3. Stem length of Asha (A, runner) and farmers' variety (B, bunch) in relation to levels of paclobutrazol across two methods of application


Figure 4. Harvested runner (Asha) plants applied with different levels of paclobutrazol at 120DAP


Figure 5. Harvested bunch (farmers' variety) type applied with different levels of PBZ at 90DAP

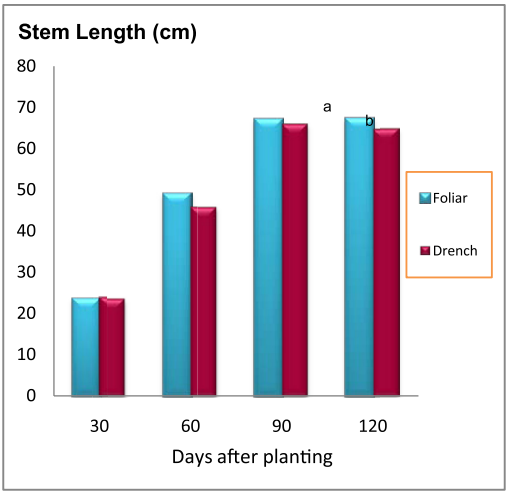


Figure 6. Stem length of Asha as affected by methods of paclobutrazol application

*Means within a column followed by a common letter is not significantly different at 5%HSD level


Figure 7. Plants with PBZ using ($A_1$) foliar and ($A_2$) drench method at harvest

**Dry Mass of Leaves**

No significant variation among varieties of peanut was recorded from 30DAP to 60DAP (Figure 8). At 90DAP, farmers' variety significantly exhibited the lower leaf dry mass compared to Asha. This may because during this stage some of the leaves of the farmer's variety have dried and fallen.

The leaf dry mass of Asha was significantly influenced by different levels of paclobutrazol at 60DAP (Figure 9A) where leaf dry mass reduction was observed with increasing levels of paclobutrazol. Untreated plants managed to maintain its high leaf dry mass from 30, 60 and 120DAP but not on 90DAP.

No significant effect on leaf dry mass of farmers' variety was noted in relation to levels of paclobutrazol throughout the sampling period (Figure 9B).

Paclobutrazol applied in both varieties using any method did not give variation to leaf dry mass except at 90DAP (Figure 10).

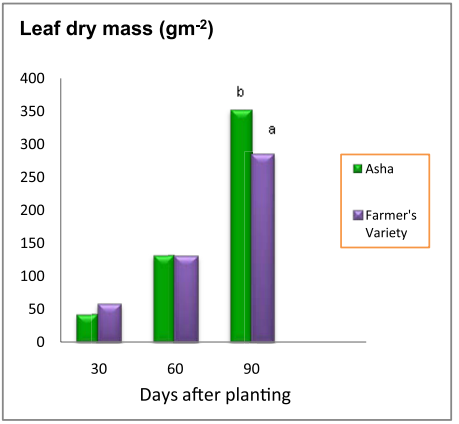


Figure 8. Leaf dry mass of runner (asha) and bunch (farmers' variety) type of peanut as affected by levels and methods of paclobutrazol application

*Means within the column followed by a common letter is not significantly different at 5% HSD level

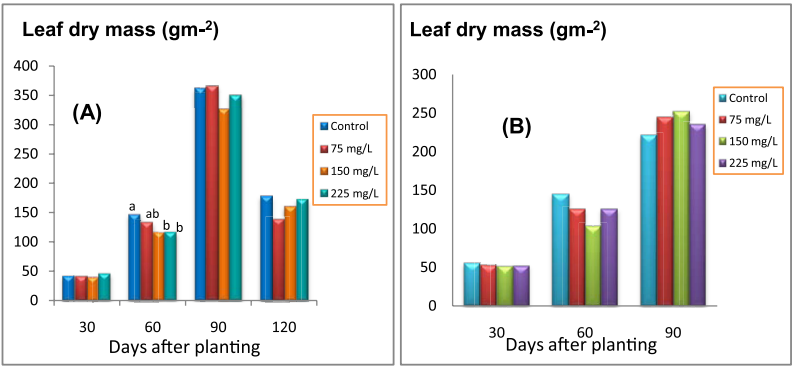


Figure 9. Leaf dry mass of Asha (A, runner) and Farmers' variety (B, bunch) in relation to levels of paclobutrazol across two methods of application

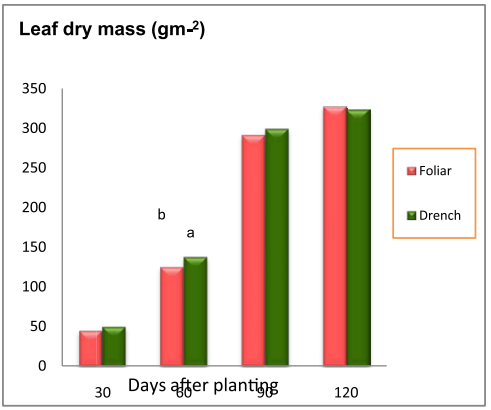


Figure 10. Leaf dry mass of peanut as affected by method of paclobutrazol application across two varieties and levels of paclobutrazol application

*Means within the column followed by a common letter is not significantly different at 5% HSD level

**Stem Dry Mass**

Data on stem dry mass, one month after treatment application showed significant results (Table 1). Asha obtained high stem dry mass compared to farmers' variety. Varietal differences particularly agronomic characteristics are one of the contributing factors resulting to high stem dry mass. Neither paclobutrazol levels nor methods of application affected stem dry mass. The stem length of Asha and farmers' variety ranges from 55.9-74.2cm and 41.0-64.0cm, respectively.

Table 1. Stem dry mass (g) of the runner (asha) and bunch the (farmers' variety) type of peanut at 60 DAP across levels and methods of paclobutrazol application

| Variety | Mean |
|---|---|
| $T_1$–Runner (Asha) | 162.33[a] |
| $T_2$–Bunch (Farmers' variety) | 135.42[b] |

*Means within the column followed by a common letter is not significantly different at 5% HSD level.

In Asha, untreated plants produced the highest stem dry mass at 120 DAP (Table 2) but apparently reduced with drench application of PBZ at 150mg/L of water.

Table 2. Stem dry mass (g) of runner (asha) as affected by levels and method of paclobutrazol application at 120 DAP

| Levels of Paclobutrazol | Methods of Application | | Mean |
|---|---|---|---|
| | $M_1$ (Foliar) | $M_2$ (Drench) | |
| $L_1$– Control | 657.33[a] | 452.00[ab] | **554.67** |
| $L_2$– 75mg/L of water | 493.33[ab] | 498.67[ab] | **496.00** |
| $L_3$– 150mg/L of water | 528.00[ab] | 446.33[b] | **487.17** |
| $L_4$– 225mg/L of water | 461.33[ab] | 613.33[ab] | **514.83** |
| **Mean** | **534.99** | **502.58** | **513.17** |

*Means within the column followed by a common letter is not significantly different at 5% HSD level.

## Dry Matter Partitioning

### Crop Growth Rate

The crop growth rate (CGR) of different varieties of peanut showed significant variation (Table 3a). Asha achieved higher crop growth rate compared to farmers' variety. There was no effect on levels of paclobutrazol and method of application on CGR.

Table 3a. Crop growth rate of runner (Asha) and bunch (farmers' variety) type of peanut in relation levels and methods of paclobutrazol application

| Variety | Mean |
|---|---|
| $T_1$–Runner (Asha) | 18.02[a] |
| $T_2$–Bunch (Farmer's variety) | 12.86[b] |

*Means within the column followed by a common letter is not significantly different at 5% HSD level.

The crop growth rate and distribution index of Asha type applied with paclobutrazol are higher compared to farmers' variety (Table 3b). As the level of paclobutrazol increases, there was a corresponding increase in the CGR of Asha. Application of paclobutrazol between 75-150mg/L slightly increased the CGR

of farmers' variety.

Paclobutrazol application increased the distribution index of Asha almost two times higher than the farmers' variety. In addition, PBZ application slightly reduced distribution index of farmers' variety lower than the untreated.

Table 3b. Crop growth rate and distribution index of different types of peanut in relation to levels of paclobutrazol

| Level of Paclobutrazol | Crop Growth Rate | | Distribution Index | |
|---|---|---|---|---|
| | Runner (Asha) | Bunch (Farmers' variety) | Runner (Asha) | Bunch (Farmers' variety) |
| $L_1$ – Control (Pure water) | 16.41 | 11.09 | 0.43 | 0.29 |
| $L_2$ – 75mg/L of water | 17.84 | 14.15 | 0.57 | 0.27 |
| $L_3$ – 150mg/L of water | 17.99 | 15.03 | 0.52 | 0.26 |
| $L_4$ – 225mg/L of water | 19.81 | 11.11 | 0.46 | 0.26 |
| **Mean** | **18.01** | **12.85** | **0.50** | **0.27** |

**Pod Growth Rate**

Neither, paclobutrazol (PBZ) levels nor methods of application affected the pod growth rate. Asha considerably obtained higher pod growth rate compared to farmers' variety which could be related to its high crop growth rate (Table 4).

Table 4. Pod growth rate of runner (asha) and bunch (farmers' variety) type of Peanut in relation to levels and methods of paclobutrazol application

| Treatment | Mean |
|---|---|
| $T_1$–Runner (Asha) | $8.79^a$ |
| $T_2$–Bunch (Farmer's variety) | $3.36^b$ |

*Means within a column followed by a common letter is not significantly different at 5% HSD level.

**Distribution Index**

Asha significantly attained higher distribution index compared to farmers' variety (Table 5). High distribution index was greatly related to the allocation of the plant for the pod growth at the expense of the vegetative parts. In addition, neither levels of paclobutrazol nor methods of application influenced the distribution index.

Table 5. Distribution index of runner (asha) and the bunch (farmers' variety) type of peanut in relation to levels and methods of paclobutrazol application

| Variety | Mean |
|---|---|
| $T_1$–Runner (Asha) | 0.495[a] |
| $T_2$–Bunch (Farmers' variety) | 0.270[b] |

*Means within a column followed by a common letter is not significantly different at 5% HSD level.

**Total Dry Mass and Harvest Index**

**Total Dry Mass**

Paclobutrazol affected the total dry mass of peanut one month after treatment application (60DAP) (Table 6a). The data revealed that the total dry mass decreased continuously when the level of paclobutrazol increases across varieties and methods of application. Reduction in total dry mass can be possibly credited to the inhibiting effect of paclobutrazol on gibberellin biosynthesis (Hartman et al., 1990). Likewise, neither varieties used nor methods of application influenced total dry mass.

Table 6a. Total dry mass (g) at 60DAP applied with different levels of paclobutrazol across types of peanut and method of paclobutrazol application

| Levels of Paclobutrazol | Mean |
|---|---|
| $L_1$– Control (Pure water) | 388.64[a] |
| $L_2$– 75mg/L of water | 330.61[ab] |
| $L_3$– 150mg/L of water | 290.37[b] |
| $L_4$– 225mg/L of water | 286.46[b] |

* Means within a column followed by a common letter is not significantly different at 5% HSD level.

Total dry mass of Asha and farmers' variety at 90DAP varied significantly (Table 6b). Asha obtained high total dry mass almost two folds higher than the farmers' variety. The difference in dry mass in Asha may be attributed to its high photosynthetic efficiency, thus contribute to the total dry mass.

Table 6b. Total dry mass (g) of runner (asha) and bunch (farmers' variety) type of peanut in relation to levels and methods of paclobutrazol application

| Treatment | Mean |
|---|---|
| $T_1$–Runner (Asha) | 1,371.84[a] |
| $T_2$–Bunch (Farmers' variety) | 729.17[b] |

*Means within a column followed by a common letter is not significantly different at 5% HSD level.

**Harvest Index**

Levels of paclobutrazol (PBZ) significantly increased harvest index of Asha but never in farmers' variety (Table 7). Asha with paclobutrazol at 75mg/L obtained the highest harvest index. This indicates that PBZ application tend to increase dry matter increment to pods in runner but not in bunch type. The data further revealed that application of PBZ beyond 75mg/L resulted to decreasing harvest index in Asha regardless of the method of application. Harvest index of farmers' variety was not altered by Paclobutrazol level nor the method of application. In fact, there was a tendency for harvest index of farmers' variety to decrease when PBZ was applied.

Increasing level of paclobutrazol consistently increased the final total dry mass of Asha while the total dry mass of farmers' variety continuously decreased when the level of PBZ went beyond 75mg/L.

Table 7. Harvest index and final total dry mass of different types of peanut in relation to levels and methods of paclobutrazol application

| | Harvest Index | | | Total Dry Mass | |
|---|---|---|---|---|---|
| Level of Paclobutrazol | Runner (Asha) | Bunch (Farmers' variety) | Mean** | Runner (Asha) | Bunch (Farmers' variety) |
| $L_1$ – Control (Pure water) | 0.315[C] | 0.425[AB] | **0.370[b]** | 1,328.2 | 751.3 |

| | | | | | |
|---|---|---|---|---|---|
| $L_2$ – 75mg/L of water | 0.498$^{A}$ | 0.397$^{BC}$ | **0.448$^{a}$** | 1,362.0 | 758.0 |
| $L_3$ – 150mg/L of water | 0.412$^{ABC}$ | 0.387$^{BC}$ | **0.399$^{ab}$** | 1,373.8 | 736.0 |
| $L_4$ – 225mg/L of water | 0.380$^{BC}$ | 0.365$^{BC}$ | **0.372$^{b}$** | 1,423.3 | 671.3 |
| **Mean** | **0.401** | **0.393** | **47.01** | **1,371.8** | **729.15** |

**Level means having the same letter (a-b) are not significantly different at 5% HSD level.
***Type and level means having the same letter (a-b) are not significantly different at 5% HSD level.

This study was delimited on the dry matter partitioning of bunch (farmers' variety) and runner type (asha) of peanut including the monthly changes in stem length, leaf and steam dry mass, crop and pod growth rate, distribution index; total dry mass and harvest index in relation to levels and methods of paclobutrazol application under field experiment.

## CONCLUSIONS

PBZ levels regardless of method of application reduced stem length. However, PBZ levels reduced leaf and stem dry mass only in Asha but not on the farmers' variety. Asha with PBZ at 75mg/L obtained the highest harvest index. The crop growth rate, pod growth rate and distribution index of Asha increased across levels and methods of PBZ application. Increasing level of PBZ increased total dry mass and number of pods of Asha. On the other hand, increasing levels of PBZ resulted to reduction in total dry mass of farmers' variety.

## ACKNOWLEDGMENTS

The authors expressed their sincerest gratitude to the Pampanga Agricultural College and Agricultural Training Institute – Region III, Philippines for providing financial assistance to this research endeavor.

## LITERATURE CITED

Chen, H. L., Huang, J. T., Li, Q. H., Qiu, G. Q., Li, S. P., & Xie, Z. Q. (2010). Effect of Paclobutrazol on Development and Quality of Valencia Type Peanut [J]. *Journal of Peanut Science*, *4*, 018.

Fletcher, R.A., A. Gilley, T.D. Davis, N. Sankhla. 2000. Triazoles as plant regulators and stress protectants. Hort. Rev., 24, 55-138.

Hampton, J. G., & Hebblethwaitez, P. D. (1985). A Comparison of the Effects of the Growth Retardants Paclobutrazol (PP333) and Flurprimidol (ELSOO) on the Growth, Development and Yield of Lolium perenne Grown for Seedt. *Seed Production*, 19.

Liang, H. D. Senlin, W. Zhizhong and W. Zhengchen. 1995. The Effect of P333 on Growth and Yield of Peanut. Journal of Shengyang Agricultural University.

Ming-hui, Y. U. (2009). 1, YU Xin-chun 1, SHEN Guan-wang 1, HU Jian-tao 1, PENG Bao-hong 2, YAN De-yuan 1 (1. Research Institute of Agricultural Sciences in Xinyang, Xinyang, Henan 464000, China; 2. Meteorological Bureau in Xinyang, Xinyang, Henan 464000, China); Application Effect of Paclobutrazol on Peanut [J]. *Tianjin Agricultural Sciences*, *1*.

Palomar, M.K. 1998, Peanut in the Philippine Food System: A Macro Study. In: Peanut in Local and Global Food Systems Series Report No. 1, Rhoades. R, PI and Nazarea, V. CoPI, Department of Anthropology, University of Georgia, USA.

Rademacher, W. (2000). Growth retardants: effects on gibberellin biosynthesis and other metabolic pathways. *Annual review of plant biology*, *51*(1), 501-531.

Tang, X.M., C. Liu, R.C. Zhong, J. Jing, Z. Han, Z. Li, F. Xiong and R. Tang. 2011. Comparative studies on the chemical regulation of peanuts by paclobutrazol, mepiquat chloride and chlorocholine chloride. Journal of Southern Agriculture. Volume 42. No. 6. Pp 603-605.

Tao, S., J. Zhang, D. Chen andL. Zhang. 2000. Study on effect of peanut seed treated with paclobutrazol and its spray concentration on peanut Intercropped. Peanut Science and Technology. No. 2.

Thakur, P.S. and A. Thakur, 1993. Influence of triacontanol and mixtalal during plant moisture stree in Lycopersicon esculentum. *Plant Physiol*. Biochem., 31(3), 433-439.

Zheng, M. 2008. Application of three plant growth regulators to peanut production.Subtropical Agriculture Research.

Zhou, W. J. and Q. F. Ye. 1996. Physiloogical and yield effects of uniconazole of winter rape (*Brassica napus* L.). J. Plant Growth Rel., 15, 69-73.