

# Analysis of Variance and Modelling Effect of Poultry Dung and Organomeniral Fertilizer on the Maize Growth

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## ABSTRACT

The determining effect of Poultry Dropping (P/D5 -Poultry dung at 50kg/ha, P/D10 Poultry dung at 100kg/ha) and Organomineral (D.M5 Organomineral at 50kg/ha) fertilizer experiments application on the growth of maize at different locations (Apomu, Iwo, and Jago). The data used for this research work is obtained from experiment performed at Institute of Agricultural Research and Training, Obafemi Awolowo University, Moor Plantation, Ibadan. To achieve this, a Complete Randomized Block Design (CRBD) was employed as the mode! in which Analysis of Variance (ANOVA) was used as a method of analysis. From the analysis it was discovered that Poultry dung at 50kg/ha, at 100kg/ha and combination of Poultry dung at 5Qkg/ha, 100kg/ha and Organominersl at 50kg/ha fertilizer has the highest effect on the Plant Height of maize at all the three locations (Apomu, Iwo and Jago). Bartlett's test was also employed to test for the homogeneity of variance for the three locations and it was observed that the variances of at least two locations are equal. A combined Analysis of data was employed to test for the interaction effect between the location and the treatments, and it was observed that there is intersection between the locations and treatments.

**Keywords**: Poultry dung, Fertilizer, ANOVA, Bartlett's teast, and CRBD

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## 1. BACKGROUND OF THE STUDY

Maize is known to have originated in Central American notably Mexico. From there, it spread to South America. The early Spanish explorers took maize from Mexico to Spain and other parts of Southern Europe, It later spread to North Africa East, West Africa and into Asia. Maize is currently grown in most tropical and warm temperate zones of the world. Maize performs best in tropical environments, although it can grow in some warm temperate zones with temperatures of 18°c to 20°c. Its optimum growth temperature ranges between 26°c and 30°c. Higher temperature of 35°c is desirable at ripening time. Areas with abundant rainfall of between, 600 and 1400mm per annum, distributed evenly during the proving season are good for maize. It grows well on well drained aerated and deep sandy loan, silt loan or clay loam soil which are rich in organic matter and plant nutrients.

### 1.1 Research Direction

The aim of this study is to increase the production of some crops such as maize, soya beans and some other among food crops and to develop agricultural system technologically. This research work deals with maize only. We further inted to determine the following:

- Find out whether $P/D_5$ $P/D_{10}$ and $O.M_5$ are important factors that determine the maize stem (plant) height in Apomu, Iwo and Jago locations of 6 weeks after planting (6 WAR).
- To test for the homogeneity of variance, that is, all of the treatments groups have the same variance.
- A combined analysis of data over three locations (Apomu, Iwo and Jago) to compare the response of the treatments whether there is difference in the plant height from locations to locations. Also, to show whether there is interaction effect between the locations and the treatments on this crops which determine the plant height?

## 2. LITERATURE REVIEW

Douglas (1876) stated that Sir Ronald fisher was the innovation in the use of statistical methods in experimental design. For several years he was responsible for statistics and data analysis at the Rothamsted Agricultural Experiment station in London, England, Fisher developed and first used the analysis of variance as the primary method of statistical analysis in Experimental design. Frank Yates worked with fisher at the Rothamsted station and the two collaborated on many project. Yates also became a primary contributor to the development of Experimental design. Many of the early application of experimental design methodology were in the agricultural and biological sciences. As a result, much of the terminologies of the discipline are derived from the agricultural background. Groebener (1963) defined Experimental Design as a set of observations taken at specified times equally at equal intervals to predict future output or to increased production. Erotox (1968) also explained that the technique of analysis of variance is employed after the results of an experiment have been obtained. Spigel (1992) expressed the view that in order to gain as much information as possible the details of an experiment much be carefully explained.

“Experiment” according to Webster’s Dictionary (1961) are: A trial of a specific observation made to confirm or disprove something doubtfully especially one under condition determine by the experiment. An act or operation undertaken in order to discover unknown principle or to establish some unknown truth. According to Collins Gem English Dictionary (1981), a trial is a something done in the hope that it may succeed, or to test theory. Encyclopaedia (1982) defined Experiment as one of the distinctive tools of a scientist that enables him to put his question to nature and receives answer. These answers lead him to problem, whose solutions require more complex experiment, improved techniques, detailed plans and better analysis of results. Encyclopaedia America (1988) volume 10, Experiment is seen as an operation designed to test a hypothesis under carefully prescribed condition or to measure a fundamental constant such as the atomic weight of an element. Montgomery (1976) stated that the factorial designs are widely used in experiments involving several factors where it is necessary to study the joint effect of these factors on a response. However, there are several special cases of the genera! factorial design that are important because they are “-widely used in research work and also because they form the basis of other design of considerable practical value.

The first of these special cases is that of K factors, each at only two levels. A complete replicate of such a design requires 2 x 2 x 2 x ... x 2 = $2^K$ observations and is called a $2^K$ factorial design. The second case is that of K factors each at three levels, which is called a $3^K$ factorial design. Suppose “that three factors, A, B and C. each at two levels are under study. The design is called a $2^3$ factorial, and the eight treatment combinations can now be displayed

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| A | - treatment | | 1 | AC | - treatment 5 | | |
| B | - | “ | 2 | BC | - | “ | 6 |
| AB | - | “ | 3 | ABC | - | “ | 7 |
| C | - | “ | 4 | control (I) | | “ | 8 |

Algebraic Signs for Calculating Effects in the $2^3$ Design

| Treatment Combination | I | A | B | AB | C | AC | BC | ABC |
|---|---|---|---|---|---|---|---|---|
| | | | | Factorial Effect | | | | |
| (1) | + | - | - | + | - | + | + | - |
| a | + | + | - | - | - | - | + | + |
| b | + | - | + | - | - | + | - | + |
| ab | + | + | + | + | - | - | - | - |
| c | + | - | - | + | + | - | - | + |
| ac | + | + | - | - | + | + | - | - |
| bc | + | - | + | - | + | - | + | - |
| abc | + | + | + | + | + | + | + | + |

Main effects of A, B and C; the two factor interactions AB, AC and BC; and the three factor interaction ABC.

Consider estimating the main effect A. The effect of A when B and C are at low level is [a-(1)]. Similarly, the effect of A when B is at high level and C is at the low level is [ab-b]. The effect of A when C is at high level and B is at low level is [ac-c]. Finally the effect of A when B and C are at high is [abc-bc].

**3. SOURCE OF DA TA**

The data used in the analysis of this research work is a secondary data from the Institute of Agricultural Research and Training, Obafemi Awolowo University, Moor Plantation, Ibadan, Nigeria. The data collected from different location of experiment i.e. Apomu, Iwo and Jago based on Week After Planting (WAR i.e. 2 WAP, 4 WAP and 6 WAR). The data also based on the Plant Height (cm) which determine the yield of the crop. The treatments used are Poultry dung at 50kg/ha ($P/D_5$). Poultry dung at 100kg/ha ($P/D_{10}$); Organomineral at 50kg/ha ($O.M_5$); combination of P/D5 and $O.M_5$; combination of P/D10 and O.SV15; combination of P/D10 and P/D5; and combination of $P/D_{10}$ 0.M5 and $P/D_5$. The institute deals more with applied farmer oriented research. Also, Supervises Adaptive System (REFILS) activities in the eight South West Agricultural Development Programmes. This rare opportunity places the institute in a unique position to interact closely with Research Extension Farmers and Inputs agencies to disseminate and receive information on improved technologies.

**4. METHODOLOGY**

The statistical methodology in this work is factorial design, because it permits the experimenter to evaluate the effect of two or more factor when used simultaneously. Since this project deals with the three factors hence the use of factorial design.

**Reason for Choosing Factorial Design.**
The factorial design was chosen because it can be used to know the significant effect of interaction of factors in an experiment.

**5. STATISTICAL MODEL EMPLOYED**

The statistical model to be used in this work is fixed model. This is because the level of factors are fixed and not chosen from large population that is there are “a” level of factor A (P/D5); v level of factor B (P/D10) and “C” level of factor C(O.M5).

Model: $Y_{ijk} = \mu + \alpha_i + \beta_j + \gamma_k + (\alpha\beta)_{ij} + (\alpha\gamma)_{ik} + (\beta\gamma)_{jk} + (\alpha\beta\gamma)_{ijk} + e_{ijkl}$
Where
$Y_{ijk}$ = independent observation, on ith treatment in jth block
$\mu$ = Overall mean effect
$\alpha_i$ = The true effect of the ith level of factor A
$\beta_j$ = The true effect of the jth level of factor B
$(\alpha\beta)_{ij}$ = The interaction effect between ith level of factor A and jth level of factor B.
$\gamma_k$ = The true effect of the kth level of factor C,
$(\alpha\gamma)_{ik}$ = The interaction effect between ith level of factor A and Kth level of factor
$(\beta\gamma)_{jk}$ = The interaction effect between jth level of factor B and Kth level of factor C.
$(\alpha\beta\gamma)_{ijk}$ = The interaction effect between ith level of factor A, jth level of factor B and Kth level of factor C
$e_{ijkl}$ = The random error
$e_{ijkl} \sim NID(0, \sigma^2)$

**Test Of Hypothesis**
The hypotheses to tested in this research work are stated as follows:

Test for Factor A (P/Ds)
$H_0$: $\alpha_i = 0$ for all levels (the effect of factor A is not significant)
$H_1$: $\alpha_i \neq 0$ (the effect of factor A is significant)

Test for Factor B (P/Ds)
$H_0$: $\beta_j = 0$ for all levels (the effects of factor B is not significant)
$H_1$: $\beta_j \neq 0$ (the effect of factor B is significant)
Test for Factor C (O/Ms)
$H_0$: $\gamma_k = 0$ for all levels (the effects of factor B is not significant)
$H_1$: $\gamma_k = 0$ (effect of factor C is significant)

Test for Interaction between Factor A and B
$H_0$: $(\alpha\beta)_{ij} = 0$, for all ij (the interaction effect between factor A and B is not significant)
$H_1$: $(\alpha\beta)_{ij} \neq 0$, (the interaction effect between factor A and B is significant)

Test for interaction between Factor A and C
$H_0$: $(\alpha\gamma)_{ik} = 0$, for all ik (the interaction effect between factor A and C is not significant)
$H_1$: $(\alpha\gamma)_{ik} \neq 0$, (the interaction effect between factor A and C is significant)

Test for interaction between Factor B and C
$H_0$: $(\beta\gamma)_{jk} = 0$, for all jk (the interaction effect between factor B and C is not significant).
$H_1$: $(\beta\gamma)_{jk} \neq 0$, (the interaction effect between factor B and C is significant)

Test for interaction between Factor A, B and C
$H_0$: $(\alpha\beta\gamma)_{ijk} = 0$, for all ijk (the interaction effect between factor A, B and C is not significant).
$H_1$: $(\alpha\beta\gamma)_{ijk} \neq 0$ (the interaction effect between factor A; B and C is significant),

## 5. ANALYSIS OF VARIANCE (ANOVA)

All the calculation that have been carried out are now summarized in a tabular form called ANOVA TABLE

| Source of Variation | Degree of Freedom | Sum of Square | Mean Sum of Square | F – Ratio |
|---|---|---|---|---|
| FACTOR A | a-1 | $SS_A$ | $MS_A = SS_A/(a-1)$ | $F(A) = {}^{MSA}/_{MSE}$ |
| FACTOR B | b-1 | $SS_B$ | $MS_B = SS_B/(b-1)$ | $F(B) = {}^{MSB}/_{MSE}$ |
| FACTOR C | c-1 | $SS_C$ | $MS_C = SS_C/(c-1)$ | $F(C) = {}^{MSC}/_{MSE}$ |
| INTERACTION AB | (a-1) (b-1) | $SS_{AB}$ | $MS_{AB} = SS_{AB}/(a-1)(b-1)$ | $F(AB) = {}^{MSAB}/_{MSE}$ |
| INTERACTION AC | (a-1) (c-1) | $SS_{AC}$ | $MS_{AC} = SS_{AC}/(a-1)(c-1)$ | $F(AC) = {}^{MSAC}/_{MSE}$ |
| INTERACTION BC | (b-1) (c-1) | $SS_{BC}$ | $MS_{BC} = SS_{BC}/(b-1)(c-1)$ | $F(BC) = {}^{MSBC}/_{MSE}$ |
| INTERACTION ABC | (a-1)(b-1)(c-1) | $SS_{ABC}$ | $MS_{ABC} = SS_{ABC}/(a-1)(b-1)(c-1)$ | $F(ABC) = {}^{MSABC}/_{MSE}$ |
| ERROR | abc (n-1) | $SS_E$ | $MS_E = SS_E/abc(n-1)$ | |
| TOTAL | abcn-1 | $SS_T$ | | |

Where A = Poultry Dung at 50 kg/ha ($P/D_5$)
B = Poultry Dung at 100kg/ha ($P/D_{10}$)
C = Organomineral at 50kg/ha ($O.M_5$)

## 6. DATA COLLECTION AND ANALYSIS

Data collection is an activity aimed at getting information to satisfy some decision objectives. The process of collecting data varies and depends upon the kind of data to be collected. This in turn depends upon the problem to be solved. Some data can be collected through control experiments some through sample survey and from day to day administration activities include industrial survey, health statistics e.t.c. In this study, we make use of secondary data. All the data in this chapter are obtained from the records of the institute of Agricultural Research and Training, Obafemi Awolowo University, Moor Plantation, Ibadan, Nigeria.

**Tabulation and Presentation Of Data**
This study covers the response or effect 'of poultry dropping and Organomineral fertilizer experiment application on the growth of maize based on plant height, of un-sterilized soil of three locations (Apornu, Iwo and Jago) and corresponding periods of planting (2 WAP, 4 WAP and 6 WAP) where WAP mean Weeks After Planting.

***TABLE 1: DATA FOR THE PLANT HEIGHT (CM) OF UN-STERILIZED SOIL, 2 WEEKS AFTER PLANTING (2WAP)***

| | | **APOMU** | | | **TOTAL** | **IWO** | | | **TOTAL** | **JAGO** | | | **TOTAL** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **TREATMENT** | **RI** | **R2 2 WAP** | **R3** | | **R1** | **R2 2 WAP** | **R3** | | **R1** | **R2 2 WAP** | **R3** | |
| | CONTROL | 20.25 | 20.00 | 21.60 | 61.85 | 20.00 | 19.48 | 20.02 | 59.5 | 18.43 | 20.00 | 19.83 | **58.26** |
| A | P/D5 | 29.50 | 29.00 | 29.00 | 87.5 | 35.50 | 25.00 | 37.50 | 98 | 31.75 | 27.75 | 25.50 | **85** |
| B | P/D10 | 28.50 | 31.00 | 29.00 | 88.5 | 24.50 | 30.00 | 33.00 | 87.5 | 31.95 | 38.20 | 27.50 | **97.65** |
| C | O.M5 | 29.50 | 26.00 | 28.50 | 84 | 35.50 | 30.00 | 33.00 | 98.5 | 32.90 | 24.50 | 35.00 | **92.4** |
| AB | P/D5 P/D10 | 31.00 | 29.00 | 30.00 | 90 | 32.00 | 30.50 | 24.25 | 86.75 | 27.25 | 28.05 | 26.35 | **81.65** |
| AC | P/D5 O.M5 | 26 | 24 | 29.50 | 79.5 | 31 | 34 | 22 | 87 | 35.50 | 33.20 | 43.70 | **112.4** |
| BC | P/D10 O.M5 | 33 | 29.5 | 30 | 92.5 | 26 | 26.75 | 33.50 | 86.25 | 25.95 | 26.50 | 31.93 | **84.38** |
| ABC | P/D5 P/D10 O.M5 | 38 | 36.5 | 33 | 107.5 | 33 | 40.50 | 35 | 108.5 | 35.50 | 29.25 | 34.75 | **99.5** |
| | **TOTAL** | **235.75** | **225.0** | **230.6** | **69135** | **237.5** | **236.23** | **238.27** | **712.0** | **239.23** | **227.45** | **244.56** | **711.24** |

***TABLE 2: DATA FOR THE PLANT HEIGHT (CM) OF UN-STERILIZED SOIL, 4 WEEKS AFTER PLANTING (4 WAP)***

| | | APOMU | | | TOTAL | IWO | | | TOTAL | JAGO | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **TREATMENT** | **RI** | **R2 4 WAP** | **R3** | | **R1** | **R2 4 WAP** | **R3** | | **R1** | **R2 4 WAP** | **R3** | |
| | CONTROL | 40.05 | 39.40 | 40.00 | 119.45 | 21.80 | 22.00 | 37.33 | 66.13 | 48.50 | 49.60 | 40.00 | **138.1** |
| A | P/D5 | 89.10 | 92 | 86.15 | 267.25 | 35.50 | 25 | 37.50 | 98 | 65.75 | 68.75 | 66 | **200.5** |
| B | P/D10 | 64.55 | 55.60 | 53.35 | 173.5 | 24.50 | 30 | 33 | 87.5 | 67.65 | 62.25 | 68.95 | **198.85** |
| C | O.M5 | 41.60 | 55.45 | 58.85 | 155.9 | 35.50 | 30 | 33 | 98.5 | 64.50 | 58 | 55 | **177.5** |
| AB | P/D5 P/D10 | 48.25 | 51.15 | 53.95 | 153.35 | 32 | 30.50 | 24.25 | 86.75 | 59 | 60.50 | 65.25 | **184.75** |
| AC | P/D5 O.M5 | 74 | 66 | 68 | 208 | 31 | 32 | 37.75 | 100.75 | 62 | 66.75 | 52 | **180.75** |
| BC | P/D10 O.M5 | 68 | 58 | 62 | 188 | 26 | 26.75 | 35 | 87.75 | 68.25 | 56.50 | 60.50 | **185.25** |
| ABC | P/D5 P/D10 O.M5 | 70 | 66 | 71 | 207 | 33 | 40.50 | 35 | 108.5 | 72.25 | 66.75 | 70.50 | **209.50** |
| | **TOTAL** | **495.55** | **483.6** | **493.3** | **1472.45** | **2393** | **236.75** | **257.83** | **733.88** | **507.9** | **489.10** | **478.20** | **1475.20** |

***TABLE 3: DATA FOR THE PLANT HEIGHT (CM) OF UN-STERILIZED SOIL, 6 WEEKS AFTER PLANTING (6 WAP)***

| | | APOMU | | | TOTAL | IWO | | | TOTAL | JAGO | | | TOTAL |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **TREATMENT** | **RI** | **R2 6 WAP** | **R3** | | **R1** | **R2 6 WAP** | **R3** | | **R1** | **R2 6 WAP** | **R3** | |
| | CONTROL | 50.30 | 49.46 | 50.40 | 150.16 | 44 | 43 | 49.80 | 136.8 | 49.90 | 50.00 | 51. 63 | **151.53** |
| A | P/D5 | 82 | 90 | 101.50 | 273.5 | 78 | 66 | 66 | 210.0 | 78 | 82 | 82 | **242** |
| B | P/D10 | 90 | 100 | 100 | 290.00 | 79.50 | 79 | 74 | 232.5 | 76.50 | 78 | 80 | **234.5** |
| C | O.M5 | 97 | 90 | 94 | 281.0 | 79.50 | 57.5 | 70 | 207 | 74.50 | 74 | 71.50 | **220.0** |
| AB | P/D5 P/D10 | 91.50 | 91.5 | 92 | 275.0 | 80 | 64 | 68.50 | 212.5 | 77.50 | 85 | 84 | **246.5** |
| AC | P/D5 O.M5 | 75.50 | 95.5 | 88 | 259.0 | 81.50 | 69.50 | 79 | 230.0 | 76.50 | 79.50 | 57.50 | **213.5** |
| BC | P/D10 O.M5 | 92.50 | 94 | 95 | 281.5 | 81.50 | 83 | 82 | 246.5 | 82.50 | 75 | 67 | **224.5** |
| ABC | P/D5 P/D10 O.M5 | 100 | 99 | 98 | 297 | 84.50 | 86.50 | 86.50 | 257.5 | 87 | 86.50 | 79 | **252.5** |
| | **TOTAL** | **678.8** | **709.46** | **718.9** | **2107.16** | **548.5** | **548.5** | **575.8** | **1732.80** | **602.4** | **610.0** | **572.63** | **1735.03** |

**Multiple Bar Charts,**

These charts enable magnitudes to be compared visually. Bars are drawn whose length is proportional to the magnitude it represents. The components are shown as separate bars adjoining each other. The height of each bar represents the actual value of the component figure. A suitable scale must be chosen and this will be indicated either at the side or the bottom of the diagram. This scale must start at zero, otherwise false impressions are given. The choice of horizontal or vertical scale is optional. This chart allows more than one set of comparisons to be made.

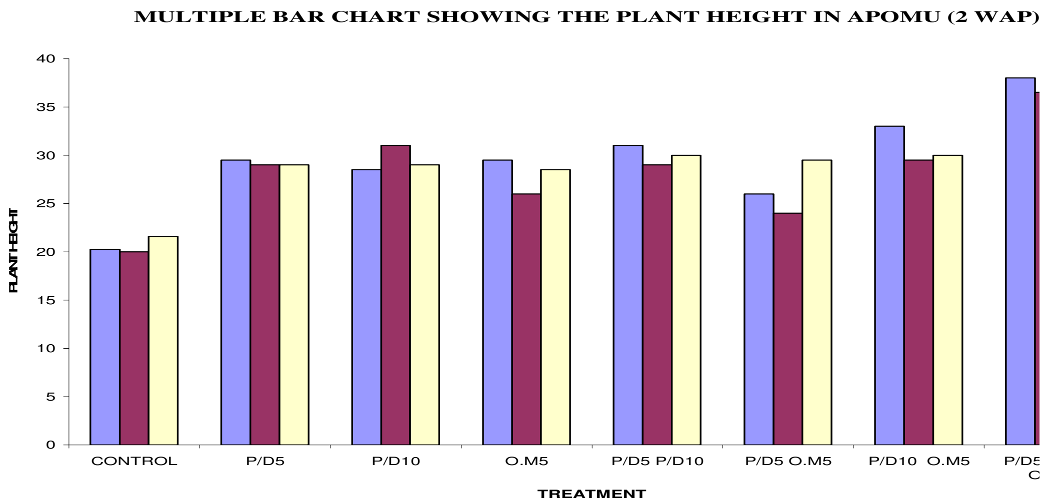


**Fig. 1:Multiple Bar Chart Showing Plant height in APOMU**

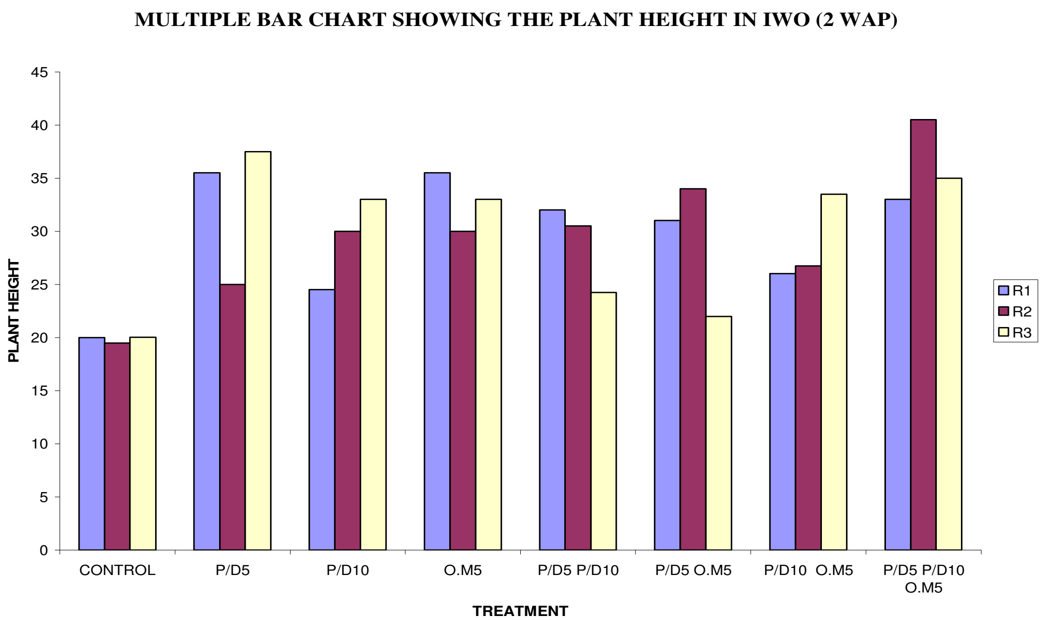


**Fig. 2: Multiple Bar Chart Showing Plant height in Iwo**

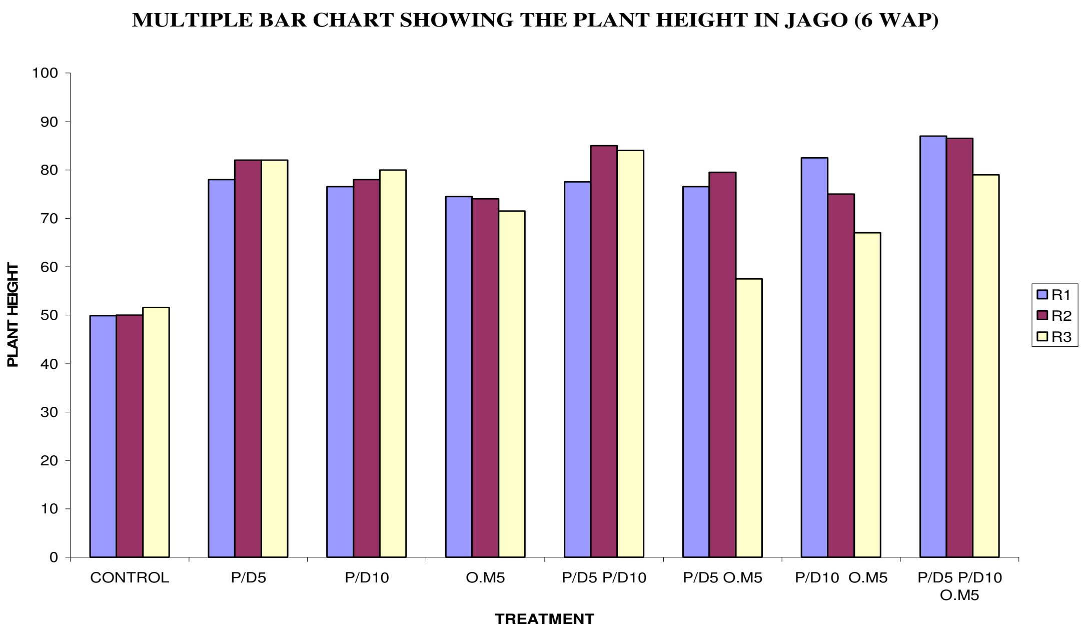


**Fig. 3.: Multiple Bar Chart Showing Plant height in JAGO**

**Interpretation and Result of Multiple Bar Charts**

1. Figure 1, the plant height increased significantly with the rate of P/D5 P/D10 O M5 fertilizer application at 2WAP in Apomu gave the tallest plant height of about 38cm.
2. Figure 2, the plant height increased with the rate of P/D5 P/D10 O.M5 fertilizer application gave
3. Figure 3, fertilizer application of P/D5 P/D10 O.M5 gave the tallest plant height of about 87cm at 6 WAP in Jago.

Comparing the value of F- calculated with F -table value, for this location we shall reject the null hypothesis for the value of A, B, AB, C and ABC, since the F-calculated value is greater than the F-table value, therefore, the treatment combination above have significant effect on the plant height of 6 weeks after planting. While, other treatment like AC and BC has no significant effect on the plant height i.e. we do not reject the null hypothesis for the treatment AC and BC.

**Analysis of data for Jago of 6 WAP table of raw data for the plant height (cm) of un-sterilized soil of 6 weeks after planting shows on the table 3.3**

**Model/Hypothesis To B**

The model used and hypothesis to be tested, critical region and level of Significance are the same as 4.1 .1 above.

**Analysis of Variance (Computation)**

$$SS_{TOTAL} = \sum\sum\sum Y_{ijk}^2 - \frac{y_{\dots}^2}{bt}$$

$= [(49.9)^2 + (50)^2 + (51.63)^2 + \dots + (79)^2] - (1785.03)^2/24$
$= 135640.9169 - 132763.8375$
$= 2877.08$



$SS_{BLOCK} = \frac{\sum y_{.j.}^2}{b} - \frac{y_{...}^2}{bt}$

$= [(602.4)^2 + (610)^2 + (572.65)^2] / 8 - (1785.03)^2 / 24$
= 132861.3596 - 132763.8375
= 97.52

We now calculate the main effect and interaction and the sum of square of main effect and interaction using + and – table as shown in treatment combination table 4.1.

A = [(-i) + a – b + ab – c + ac – bc + abc]
= [-151.53 + 242 – 234.5 + 246.5 – 220 + 213.5 – 224.5 + 252.5]
= 123.97

B = [(-i) - a + b + sb - c - ac + be + abc]
= [-151.53 - 242 + 234.5 + 246.5 – 220 - 213.5 + 224.5 + 252.5]
= 130.97

AB = [(i) - a - b + ab + c - ac - be + abc]
= [151.53 - 242 - 234.5 + 246.5 + 220 - 213.5 – 224.5 + 252.5]
= -43.97

C = [(-i) - a - b - ab + c + ac + bc + abc]
= [-151.53 - 242 - 234.5 - 246.5 + 220 + 213.5 + 224.5 + 252.5]
= 35.97

AC = [(i) - a + b - ab - c + ac - bc + abc]
= [151.53 - 242 + 234.5 - 246.5 - 220 + 213.5 - 224.5 + 252.5]
= -80.97

BC = [(i) + a - b - ab - c - ac + bc + abc]
= [151.53 + 242 - 234.5 - 246.5 - 220 - 213.5 + 224.5 + 252.5]
= -80.97

ABC = [(i) + a + b - ab + c - ac - bc + abc]
= [-151.53 + 242 + 234.5 - 246.5 + 220 - 213.5 - 224.5 + 252.5]

= 112.97

We now calculate the sum of square for main effect and interactions.

$SS_A = (123.97)^2/24$
= 640.36

$SS_B = (130.97)^2/24$
= 714.71

$SS_{AB} = (-43.97)^2/24$
= 80.56

$SS_C = (35.97)^2/24$
= 53.91

$SS_{AC} = (-80.97)^2/24$
= 273.17

$SS_{BC} = (-43.97)^2/24$
= 80.56

$SS_{ABC} = (112.97)^2/24$
= 531.53

$SS_{ERROR} = SS_T – [SS_A + SS_B + SS_{AB} + SS_C + SS_{AC} + SS_{BC} + SS_{ABC} + SS_{BLOCK}]$
$= 2877.08 – [640.36 + 714.71 + 80.56 + 53.91 + 273.17 + 80.56 + 531.76 + 97.52]$
$= 404.53$

**TABLE .4 ANALYSIS OF VARIANCE TABLE**

| Source of variation | DF | S.S. | MS | F-ratio |
|---|---|---|---|---|
| | 2 | 97.52 | 48.76 | 1.69 |
| A | 1 | 640.36 | 640.36 | 22.2 |
| B | 1 | 714.71 | 714.71 | 24.7 |
| AB | 1 | 80.56 | 80.56 | 2.8 |
| C | 1 | 53.91 | 53.91 | 1.9 |
| AC | 1 | 273.17 | 273.17 | 9.5 |
| BC | 1 | 80.56 | 80.56 | 2.8 |
| ABC | 1 | 531.76 | 531.76 | 18.4 |
| ERROR | 14 | 404. 50 | 28.90 | |
| TOTAL | 23 | 2877.03 | | |

Comparing the value of F- calculated with F-table value. Since F Calculated is greater than F- table value for A, 8, AC and ABC, we shall reject the null hypothesis, therefore, tie treatment combination above have significant effect on the plant height of 6 weeks after planting due to the application of A, B, AC and ABC treatments. While other treatment combination has no significant effect on the plant height due to application of AB, C and BC treatments (i.e. we do not reject the null hypothesis).

## 8. INTERPRETATION OF RESULTS, CONCLUSION AND RECOMMENDATION.

### 8.1 Interpretation of results

Significance effect of factor A (P/D5), factor B (P/D10) and factor C (O.M5) treatments on the plant height of maize crop based on the 3 locations (Apomu, Iwo and Jago). From Apomu there is no enough evidence to accept the null hypothesis (Ho at 5% level of significance) for factor A, B, AB, C, AC BC and. ABC, This is an indication that all the treatment in this location significantly affects the plant height of the crop (Maize). Also, in Iwo factors A, B, AB, C and ABC significantly affect the plant height. As for Jaao, there is no enough evidence to accept the null hypothesis at 5% level of significance for the factors A, B, AC and ABC, which indicate that they significantly affect the plant height. For the three locations (Apomu, Iwo and Jago), we could see that factors A and B brought about increase in plant height throughout the three locations of experimentation.

More so, among ail possible interactions effect available throughout the three locations of experimentation, interaction ABC showed that there is significance interaction effect at 5% level of significance. The test for the equality of variance for all the three locations showed that there is homogeneity of variance between the levels of al factors at 5% level of significant. Finally, combining the analysis of result of th-3 three location, the data reveals that we have sufficient evidence to reject the null hypothesis at 5% level of significance, which indicate that there is different in plant height from location to location, also the interaction AB, AC, BC and ABC showed that there is significance interaction effect at 5% level of significance.

## 9. CONCLUSION

With the outcome of the test performed on factor A, B, C: the effect of the three factors have shown to 5% highly significant at 5% level of significance. This means that the application of treatment at different rate contributed to the plant height which can lead to the yield of maize. Now to the test for the equality of variance for the three locations i.e. to know whether the test indicated that there was variation. But if the variances are not homogeneous then the combine analysis could not be done. The assumption of homogeneity of variance holds.

Therefore, where an assumption fails to hold in the original data, a transformation on the data may make the assumption valid. Now combining the result we could see that there are difference in the plant height and we can conclude that the application of treatment at different level determine the plant height irrespective of the soil location, we could say that ail the treatment are very important to the plant height of the crop. From the result, it was discovered that the poultry dung at 50kg/ha, at 100kg/ha and combination of Poultry dung at 50kg/ha, at 100kg/ha and Organ mineral at 50kg/ha fertilizer has the highest effect on the plant height of maize at all the three locations (Apomu, Iwo and Jago). Also, when combined data to test for interaction between the fertilizer treatments and location. It was discovered that there is interaction between the locations and treatments.

The inorganic fertilizers are usually not available and are *always* rather expensive for the low-income, small-scale farmers. Organic manures can be used as an alternative for the inorganic fertilizers. They release nutrients rather slowly and steadily over a longer period and improve the soil fertility status by activating soil microbial biomass. Soil composition research programme should be intensified so as to know the salinity level and three yield.

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