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**Research Paper**

# Investigation of poultry manure on growth and proximate composition of some indigenous vegetables Ukpor (*Mucuna flagellipes*) and Bitter leaf (*Vernonia amygdalina)*

AGBA, O.A
*Department of Agronomy,Faculty of Agriculture and Forestry, Cross River University of Technology, Obubra campus, Cross River State , Nigeria*

***ABSTRACT***
*Vegetables especially Ukpor (Mucuna flagellipes) and Bitter leaf (Vernonia amygdalina) have many economic importance as food medicinal herbs, spice and raw materials for cosmetics and pharmaceutical industries . Their commercial production is very lowand regular supply in large quantity is lacking .This study investigated the effects of four poultry manure rates: 0,3, 7 and 12t /ha on two indigenous vegetables Ukpor (Mucuna flagellipes) and Bitter leaf (Vernonia amygdalina)early growth and proximate composition . The experimental design was a 2 x 4 factorial of two vegetables and 4 poultry manure rates, laid out in randomized complete block design with eight treatments combinations replicated three times . The proximate composition of thesevegetables was determined using standard methods of Association of Official Analytical Chemist (AOAC). The results indicated that the growth and proximate (g/100g) in fresh weight basis significantly (P>0.05) varied with poultry manure treatments and range: leaf (moisture 62.86, 71.43%s), fat (3.45, 4.27%), fibre (11.70, 10.28%), Ash (15.10, 16.16%),and carbohydrate (36.45, 35.26) in Ukpor (Mucuna flagellipes) and Bitter leaf (Vernonia amygdalina) respectively. Poultry manure at 10t/ha gave the tallest plants height (175.11cm, 70.59cm), dry weight: leaf (63.01g, 91.14g ), Stem(44.26g, 91.14g) per plant in Ukpor (Mucuna flagellipes) and Bitter leaf (Vernonia amygdalina) respectively at 12 weeks after planting. Minerals content: calcium, magnesium, potassium, phosphorus, and sulphur were higher in plots treated with poultry manure than the untreated plots. Farmer are advised to use 5 or 10 ton/ha poultry manure to cultivate Ukpor (Mucuna flagellipes) and Bitter leaf (Vernonia amygdalina) for increase high proximate composition and early growth to provide regular supply.*
***Key Words:*** *poultry manure,Mucuna flagellipes , Bitter leaf ( Vernonia amygdalina), proximate composition, growth.*

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## I. INTRODUCTION

Vegetables are herbaceous or soft plants that may be eaten raw in salad, partiallycooked alone or combination with other product, preparations ( meat, fish, maize ,yam, ect) (Adeoku *et al*; 2006, Ndagu *et al*;2011). Most vegetables are refreshing, with aromatic taste , spice, flavours essential for man and livestock body calories, proteins, vitamins electrolytes ,minerals and other dietary constituents (Ndagu *et al*, 2011).

Indigenous vegetables such as Bitter leaf (*Vernonia amygdalina*) and Ukpor *(Mucuna flagellipes*) are rich in vitamins A, B, C and k which are protect the body against diseases and contribute significantly to balance diet and good health (Eneifj khali, *et al*;2012) . Ukpor *(Mucuna flagellipes*) is of the fabacea family, an annual or perennial plant depending on the weather and soil water conditions. It is one of the lesser known legume in Nigeria with many uses as food, spice, flavor,, leaves and seeds are raw materials in cosmetics and pharmaceutical industries (Okoro,2007, Eyuich ,2010). The crop is a climbing herb with compound trifoliate leaves. Literature on it cultivation in commercial *Vernonia amygdalina*scale is scanty.

Bitter leaf (*Vernonia amygdalina*) is a leafy vegetable grown as a semi- wild shrub perennial erect plant with height that varies between 2-6 meters depending on the soil nutrients and moisture ( Germaniel and Akeh 2014). The plant is commonly found in the semi- wild habitat and some compound mostly close to kitchen and some streams for it food and medicinal value.

Currently, there is high demand for *Mucuna flagellipes* and Bitter leaf *(Vernonia amygdalina*) both for food, medicinal and industrial uses. Their cultivation is still predominantly sub-subsistence and mostly in the hands of poor rural peasant women farmers that grow it as a compound crop close to their kitchen without knowledge of their cultivation techniques, fertilizer need and proximate composition.

Despite the economic importance of these crops , there is scanty literature information on the cultivation techniques of these vegetables either as sole or in mixed cropping with other crops. The effects of poultry manure on the early growth especially proximate and minerals composition are lacking. Therefor the aim of this study was to investigate the effects of poultry manure rates on the early growth and proximate composition of Bitter leaf *(Vernonia amygdalina*) and Ukpor *(Mucuna flagellipes).*

## II. MATERIALS AND METHODS

Experimental Site

The Experiment was conducted in the Teaching and Research, farm, Department of Agronomy, Faculty of Agriculture and Forestry, Obubra, Cross River University of Technology, South, Nigeria. Obubra lies in latitude $05^0$ $59^{''N}$ and longitude $08^0$ $15^{''}$E (CRADP, 2000).

EXPERIMENTAL DESIGN

The design was a 2x4 factorial of two Nigeria indigenous vegetables (Bitter leaf plant (*Vernonia amygdalina* and Ukpor (*Mucuna Flagellipes*) and four poultry manure rates (0, 3, 7 and 12) tons/ha laid out in randomized complete block design ((RCBD) with 3 replications.Bitter leaf plant was propagated vegetatively using stem cuttings (since it has no viable seeds). Fresh stem cuttings were obtained from an old women (peasant farmer ) who grow it in her compound close to kitchen. Stems were cut into pieces of 7 to 9cm with each having 3 to 5 nodes, 2-3 nodes were cover in soil bed at $45^0$ to horizontal position. While 2 nodes were left out of the soil to sprout. Planting was done at spacing of 80 x 60cm inter and intra row spacing respectively.

Ukpor (*Mucuna, flagellipes*) was propagated by seeds. Mature seeds were collected from Obubra market . They were soak in water at room temperature for 24 hours before planting at the rate of 2 seeds per hole at a spacing of 1m x 50cm inter and intra row respectively.

Poultry manure application

Well cured poultry manure was collected from broilers poultry pens in Obubra Local Government Area, Cross River State. It was stored in sacks bags for four weeks to decompose before application. The manure was applied at 4 weeks before application during land preparation.

The experimental field was divided into eight plots according to treatments combinations per block. The plots were tag with labels indicating the appropriate poultry rate (0, 3, 7 and 12) t/ha.

Data Collection

The effects of poultry manure on the vegetative growth of bitter leaf (*Vernonia amygdalina*) and Ukpor (mucuna flagellipes) was measured by physical counting of number of leaves, branches per plant, and plant height (cm) at 6 and 12 weeks after planting.

Samples Collection and Preparation

Whole plants of bitter leaf f (*Vernonia amygdalina*) and Ukpor (*Mucuna flagellipes*) were uprooted, washed in a tap water to remove the soil debris and the leaves were detached from plant. The detached leaves were further washed in running distilled water.

The leaves were blended in a kenwood blender

The protein analysis was performed immediately to avoid denaturation followed by the moisture and fat content. The crude fibre and ash content were the last.

The carbohydrates were calculated by (adding moisture, ash, crude fibre, fat and protein and subtracting these values from 100%). While others were determined through the methods described by Association Of Analytical Chemist (2000).

Crude protein determination (Micro Kjeldahl Method).

The analysis was conducted in three stages:

i. Digestion stage
ii. Distillation stage
iii. Titration stage.

Digestion stage:

One (1) gram of ground fresh leaves of Bitter leaf (*Vernonia amygdahia*) and Ukpor (*Mucuna flagelipes*) weighed out differently according to different poultry manure rates into 50ml labeled Kjedahl flash.

A two (2) ml of concentrated sulphuric acid ( $H_2SO_4$) was carefully added and a pinch of catalyst (Mixture of Selenium Oxide, $K_2SO_4$ and $CuSO_4$).

Continuous heating was applied on digestion rack under a fume hood until a clear greenish solution appears. After the digest has cleared the mixture was heated for another 2 minute and allowed to cool.

A 10ml of distilled water was added to avoid caking and volume was made up to 50ml of digested sampled was transferred into the Kjeldahl apparatus and a receiver flask ((50mls) containing 20ml of boric acid and 2 drops of double indicator (Methyl red and Methyl blue) solutions was placed under the condenser of the distillation apparatus. A 10ml of 40% NaOH solution was added through a funnel stop cork and distillation commenced.

A 35ml of distillates was collected through the condenser tip an titrated with 0.1 Mol standard Hydrochloric acid until a pale pink colour end point was obtained. Protein concentration was calculated using the formula

$$\% \text{ Nitrogen} = \frac{\text{Titre value x 14.1 x 0.01 x 100 x 50}}{\text{1000 x 1g x 10ml.}}$$

% Protein = % Nitrogen x 6.25

Where 6.25 is a constant.

Determination of Moisture Content

The grounded samples of fresh leaves of Bitter leaf (*Vernonia amygdalina* and Ukpor (*Mucuna flagellipes*) were weighed 2g into pre-weighed labelled crucibles and placed in a $600^0$C hot air circulating oven for six (6) hours to a constant weight. The moisture content was calculated as the difference in weight after drying as shown below:

$$\frac{W_2 - W_3}{W_1} X \frac{100}{1}$$

Where $W_1$ = initial weight of sample

$W_2$ = Weight of crucible + sample after drying.

$W_3$ = final weight of crucible + sample after drying.

Determination of crude fat content .

2g of the grounded samples were put into the Soxhlet extractor thimble wrapped with cotton wool. A 200ml of petroleum ether (bpt 60 – $80^0$C) was poured into 300ml round bottom flask containing anti-bombings and soxhlet extractor assembled. The sample was extracted for 4 hours until the extract become colourless. The extract was poured into a dried pre-weighed beaker and the thimble rinsed with a little quantity of petroleum ether back into the beaker. The beaker was heated on a steam bath to drive off the solvent.

The extracted fat left in the beaker was dried in desiccators and weighed

$$\% \text{ Fat} = \frac{W_3 - W_2}{W_1} X \frac{100}{1}$$

Where $W_1$ = weight of empty flask

$W_2$ = weight of sample

$W_3$ = weight of flask oil after drying.

Determination of Crude Fibre Content.

2g of grounded fresh sample was put in 400ml beaker that contain 150ml of 0.128M per heated $H_2SO_4$ solution was added and made up to 200ml with distilled water and stirred. The mixture was heated with continuous stirring for 30 minutes and allowed to cool and settle.Distilled water was added and allowed to cool and settle then filtered, the residue was washed three times with hot water with acetone to make the mixture acid free. A 150ml of 0.128m per heated NaOH was added to the residue in a 400ml beaker (drops of antifoaming agent was added) and heated to boil slowly for 30 minutes and then filtered.

The residue was washed three times with hot water and another three times with acetone.

The residue was dried at $103^0$C in a crucible in an oven for 1 hour. Weigh an put in a muffle furnace at $500^0$C after ashing weigh again, then calculate percentage fibre using the formula below:

$$\% \text{ Fibre} = \frac{W_2 - W_3}{W_1} X \frac{100}{1}$$

Where $W_1$ = weight of ground sample

$W_2$ = weight of residue after drying at $103^0$C.
$W_3$ = weight of residue after ashing.

Determination of total carbohydrate content.

This was obtained by adding each percentage value of protein, fat, fibre, and ash content from total dry matter.

% Carbohydrate = 100 – (% moisture + ash + fat + fibre + % protein)

Data Analysis

All data collected (vegetative growth parameter and proximate composition) were subjected to Analysis of variance (ANOVA) using GENSTAT(2007)12$^{th}$ edition statistical software.

Mean separation was done using fishers least significant difference (LSD) at 5% probability level as described by Obi (2002).

## III. RESULT AND DISCUSSION

The soil of the experimental site were sandy loam, slightly acidic, low in organic carbon, nitrogen, phosphorus and exchangeable bases as shown by the analysis of physico-chemical properties of the soil presented in Table 1. Soil of this nature that are low in plant nutrients require application of organic manure especially poultrymanure to increase it fertility for higher crops growth, yield and quality (Maunde *et al*, 2013).

The application of poultry manure significantly (p>0.05) increased the growth of *Mucuna fagellipes* and Bitter leaf (*Vernonia amygdalina*). Ten (10t/ha) poultry manure gave the highest number of leaves 41.47, 36.72), branches (8.31, 10.04) and plant height (175.11cm, 70.59cm) of *Mucuna flagellipes* and respectively were obtained at 12 weeks after planting (WAP) (Table 2). *Vernonia amygdalina*Similar increases in vegetative growth in plant height, leaves and branches number per plant in response to poultry manure have been reported by Akon *et al*, (2018).

Result of the proximate analysis indicated that moisture (71.4%), crude protein (32.30%) and fibre (12.28%) were higher in Bitter leaf (*Vernonia amygdalina)* than in *Mucuna flagellipes* of 62.86%, 24.08% and 11.20%, moisture, protein and fibre content respectively as affected by poultry manure content shown in Table 3.These higher values of moisture, proteins and fibre noticed in this study are similar to those obtained by Emeifej *et al*, (2021). Ishieze *et al*, (2018) also reported high protein context in some vegetable influenced by application of poultry manure.

More fat was recorded in *Mucuna flagellipes* as poultry manure rate increased from 5 to 10t/ha as compare to Bitter leaf plant (Tabe 3).

This findings corroborate the works of Chinyere *et al*, (2009). They observed higher fats and fibre content in plant that were applied with poultry manure. They recommended that some fat can be extracted from these vegetables and use as good emulsifier and foaming agents in bakery, bread and ice cream production.

The higher values of the proximate composition observed in higher rates of poultry manure probably may be due to the increased availability of plant nutrients which might have increased the production of some phytochemicals in the vegetables.

Result in Table 4 showed increased in the dry matter yield of the two vegetables ( Ukpor (*Mucuna flagellipes*) and Bitter leaf (*Vernenia amygdalina)).The increase in the dry matter in leaves and stem of the two crops with application of poultry manure indicated that more nutrients were provided in the soil that encouraged rapid growth and accumulation of dry matter in plants parts.* According to Brady and Well, 2004 provision of sufficient quantities of poultry manure encouraged raid vegetative growth and uptake of nutrient s from the soil resulting in high dry matter yield of crops.

The effects of poultry manure on the uptake of *potassium, calcium, phosphorus, magnesium* are shown in Table 5. The increased of the above minerals content of the two crops *Mucunaflagellipes* and Bitter leaf shoots observed in this studies could be attributed to increased in respiratory process and dilution effects resulting from increased growth activities following the application of poultry manure. This result conforms to similar findings that humic acid release from organic manure decomposition increase respiratory processes , hormonal growth responses , chlorophyll content, uptake of nutrients and growth activities in plants. The significant interactions between poultry manure and the two indigenous vegetables on dry matter weight and proximate composition affirmed the role of poultry manure in promoting growth , dry matter weight and proximate composition in plants ( Bationo, 2008).

## IV. CONCLUSION

The cultivation of Bitter leaf (*Vernoniaamygdalina)* and Ukpor (*Mucuna flagellipes*) with poultry manure increased their proximate, phytochemicals and minerals composition, hence increase nutritional and medicinal value of these vegetables. It is recommended that 7 or 12t/ha poultry manure should be applied in cultivating these vegetables for increase high leaf yield, proximate and minerals composition that are useful to man, livestock nutrition and medicinal purposes.

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**Table 1.** Physico – chemical properties of experiment site during 2020 cropping before and after harvesting of crops.

| | | Before planting | | After harvesting | |
|---|---|---|---|---|---|
| | | Soil depth(cm) | | Soil depth(cm) | |
| Particle size distribution | | 0-15 | 15-30 | 0-15 | 15-30 |
| Clay(%) | | 10 | 15 | 17 | 15 |
| Silt (%) | | 30 | 21 | 30 | 21 |
| Sand (%) | | 32 | 37 | 32 | 37 |
| Textural class | | Sandy loam | | | |
| Chemical Characteristics | | | | | |
| PH in water | | 5.80 | 5.72 | 5.80 | 5.72 |
| PH in 0.01 m CaCl | | 4.81 | 4.73 | 4.81 | 4.73 |
| Organic carbon (g/kg) | | 11.34 | 5.46 | 2.51 | 6.83 |
| Available phosphorus (mg/kg) | | 7.14 | 2.73 | 6.12 | 5.14 |
| Exchangeable bases (Cmol/kg) | | | | | |
| Calcium | | 0.57 | 0.93 | 0.43 | 0.81 |
| Magnesium | | 0.46 | 0.32 | 0.38 | 0.25 |
| Potassium | | 0.24 | 0.260.41 | 0.41 | 0.52 |
| Sodium | | 0.48 | 0.23 | 0.35 | 0.28 |
| Exchangeable acidity | | | | | |
| Hydrogen | | | | | |
| Aluminum | | | | | |
| Cation exchangeable capacity | | 6.82 | 12.14 | 5.73 | 4.62 |

**Table 2.** Effects of poultry manure on early growth (number of leaves, branches, plant height (cm) of Ukpor (*Mucuna flagellipes* and bitter leaf (*Vernonia amygdalina*)

| | Vegetables Growth parameters | | | | | | |
|---|---|---|---|---|---|---|---|
| Poultry manure Rate (t/ha) | | Number of Leaves per plant | | Number of Branches per plant | | Plant Height (cm) | |
| | **Vegetables Names** | 6WAP | 12WAP | 6WAP | 12WAP | 6WAP | 12WAP |
| 0 | Ukpor (*Mucuna flagellipes*) | 10.21 | 24.32 | 1.11 | 3.21 | 51.35 | 103.23. |
| 3 | | 15.32 | 37.23 | 2.13 | 5.24 | 75.46 | 166.58 |
| 7 | | 18.13 | 41.12 | 3.11 | 7.112 | 994.73 | 187.45 |
| 12 | | 23.41 | 63.4 | 4.22 | 8.31 | 125.34 | 243.17 |
| Mean | | 16.77 | 41.47 | 2.64 | 6.97 | 6.72 | 175.11 |
| LSD(0.05) | | 0.50 | 3.01 | 0.02 | 0.11 | 2.13 | 3.22 |
| | Bitter leaf *(Vernonia anygdalina*) | | | | | | |
| 0 | | 6.12 | 20.21 | 1.01 | 3.31 | 22.24 | 31.34 |
| 3 | | 11.33 | 31.30 | 3.12 | 6.23 | 41.37 | 69.85 |
| 7 | | 14.15 | 43.21 | 4.20 | 8.12 | 56.28 | 87.63 |
| 12 | | 19.41 | 52.13 | 5.14 | 10.04 | 68.55 | 93.52 |
| Mean | | 12.75 | 36.72 | 3.37 | 4.68 | 47.11 | 70.59 |
| LSD(0.05) | | 0.41 | 2.11 | 0.11 | 0.28 | 3.12 | 4.28 |

**Table 3**. Effects of poultry manure on proximate composition of two vegetables plant leaves Ukpor (*Mucuna flagellipes* )and bitter leaf (*Vernonia amygdalina* )

| | Vegetables Growth parameters | | | | | | |
|---|---|---|---|---|---|---|---|
| Poultry manure Rate (t/ha) | Vegetables Names | Proximate composition parameters | | | | | |
| | Ukpor (*Mucuna flagellipes*) | Moisture (%) | Ash (%) | Carbohydrate(%) | Fat (%) | Crude protein(%) | Crude Fibre(%) |
| 0 | | 56.12 | 10.35 | 31.23 | 3.12 | 17.34 | 9.14 |
| 3 | | 60.31 | 14.43 | 35.16 | 4.28 | 23.16 | 10.23 |
| 7 | | 63.43 | 16.51 | 38.22 | 5.41 | 26.51 | 12.16 |
| 12 | | 71.58 | 19.11 | 41.18 | 6.54 | 29.32 | 14.25 |
| Mean | | 62.86 | 15.10 | 36.45 | 5.31 | 24.08 | 11.70 |
| LSD(0.05) | | 1.02 | 0.51 | 0.21 | NS | 2.57 | 0.24 |
| | Bitter leaf *(Vernonia anygdalina*) | | | | | | |
| 0 | | 57.32 | 12.13 | 30.11 | 3.23` | 24.31 | 9.22 |
| 3 | | 63.53 | 16.24 | 34.13 | 3.32 | 30.43 | 12.31 |
| 7 | | 75.24 | 18.12 | 37.34 | 3.13 | 35.15 | 14.43 |
| 12 | | 88.11 | 20.13` | 39.47 | 3.42 | 39.32 | 15.16 |
| Mean | | 71.25 | 16.16. | 35.26 | 4.27 | 32.30 | 16.28 |
| LSD(0.05) | | 0.03 | 1.11 | 0.29 | NS | 2.170.31 | 0.31 |

**Table 4.** Effects of poultry manure dry matter yield of leaf and stem (g/plant) of Ukpor (*Mucuna flagellipes and bitter leaf (vernonia amygdalina)*

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Poultry manure Rate (t/ha) | Vegetables Names Ukpor (*Mucuna flagellipes*) | Leaf dry yield per plant (g) | | Stem dry yield per plant (g) | | Root dry yield per Plant (g) | |
| | | 6WAP | 12WAP | 6WAP | 12WAP | 6WAP | 12WAP |
| 0 | | 20.65 | 34.85 | 9.42 | 17.36 | 5.17 | 14.25 |
| 3 | | 31.74 | 53.26 | 16.18 | 36.79 | 11.25 | 23.49 |
| 7 | | 45.83 | 71.34 | 29.75 | 52.27 | 26/37 | 35.18 |
| 12 | | 61.29 | 82.57 | 44.57 | 70.52 | 38.58 | 50.37 |
| Mean | | 39.88 | 43.01 | 24.96 | 44.26 | 20.34 | 30.82 |
| LSD(0.05) | | 1.03 | 3.21 | 2.18 | 1.12 | 1.32 | 2.43 |
| | Bitterleaf *(Vernonia anygdalina*) | | | | | | |
| 0 | | 17.85 | 40.17 | 25.66 | 50.82 | 31.15 | 45/27 |
| 3 | | 28.63 | 53.39 | 42.78 | 77.93 | 50.64 | 63.81 |
| 7 | | 35.37 | 62.51 | 69.85 | 96.28 | 65.32 | 80.27 |
| 12 | | 50.72 | 75.26 | 82.43 | 134.52 | 73.75` | 91.54 |
| Mean | | 21.89 | 57.83 | 55.18 | 91.14 | 55.21 | 70.22 |
| LSD(0.05) | | 2.12 | 3.1 | 5.12 | 7.21 | 4.32 | 3.12 |

Table 5. Effects of poultry manure on potassium, calcium, phosphorus, magnesium and sulphur shoot content (%) and up take from the soil (g/plant ) by Ukpor (*Mucuna flagellipes* )and bitter leaf (*Vernonia amygdalina* )

| Poultry manure Rate (t/ha) | Vegetables Names Ukpor (*Mucuna flagellipes*) | potassium | | Magnesium | | Calcium | | Phosphorus | | Sulphur | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | shoot | Up take from soil | shoot | Up take from soil | shoot | Up take from soil | shoot | Up take from soil | Shoot | Uptake from soil |
| 0 | | 0.43 | 0.3241 | 0.51 | 0.2714 | 0.63 | 0.4425 | 0.35 | 0.2183 | 0.28 | 0.3105 |
| 3 | | 0.67 | 0.5335 | 0.74 | 0.4521 | 0.84 | 0.7131 | 0.66 | 0.8342 | 0.45 | 0.5312 |
| 7 | | 0.74 | 0.6458 | 0.83 | 0.5735 | 1.43 | 0.8521 | 0.97 | 1.015 | 0.68 | 0.7168 |
| 12 | | 0.85 | 0.7279 | .97 | 0.6921 | 1.89 | 0.9852 | 1.65 | 1.0897 | 0.93 | 1.0311 |
| Mean | | 0.623 | 0.5578 | 0.7625 | 0.4973 | 1.1975 | 0.7748 | 0.9075 | 0.788 | 0,585 | 0.6474 |
| LSD(0.05) | | 0,005 | 0.001 | 0.003 | 0.001 | 0.03 | 0.04 | 0.02 | 0.05 | 0.02 | 0.001 |
| | Bitter leaf *(Vernonia anydalina*) | | | | | | | | | | |
| 0 | | 0.39 | 0.4316 | 0.62 | 0.3341 | 0.65 | 0.4513 | 0.517 | 0.3392 | 0.48 | 0.2534 |
| 3 | | 0.81 | 0.4316 | 0.83 | 0.5173 | 0.92 | 0.8214 | 0.734 | 0.5346 | 0.61 | 0.4627 |
| 7 | | 0.95 | 1.0315 | 1.21 | 0.6315 | 1.78 | 0.9115 | 0.873 | 0.6218 | 0.75 | 0.8315 |
| 12 | | 1.34 | 1.5246 | 1.75 | 0.7724 | 2.69 | 1.032 | 1.123 | 0.8111 | 0.93 | 1.0478 |
| Mean | | 0.8725 | 0.9325 | 1.1025 | 0.5638 | 1.510 | 0.8041 | 0.8083 | 0.5787 | 0.88 | 0 .6478 |
| LSD(0.05) | | 0.003 | 0;005 | 0.02 | 0.003 | 0.04 | 0.02 | 0.01 | 0.03 | 0.003 | 0.004 |