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Effect of nitrogen fertilizer on the nutritional composition of twenty accessions of pumpkin (*Cucurbita pepo* Linn.) in Unwana, Ebonyi state

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Abstract

Pumpkin is a vegetable crop in high demand and which commands a high price in the South eastern parts of Nigeria because of its nutrient content despite of its low production due to insufficient or no fertilizer application. In view of this, an experiment was conducted at Department of Horticulture and landscape Technology, AkanuIbiam Federal Polytechnic, Unwana with the aim of determining the optimum nitrogen fertilizer rate (Urea) that could maximize accessions of pumpkin productivity. The experiment was conducted in 4 x 20 factorial laid out in a randomized complete block design (RCBD) with three blocks. The treatment comprised of twenty (20) accessions of pumpkin and four rates of urea fertilizer (0. 60. 120 and 180kg/ha). The parameters accessed were the proximate constituents of the pulps (carbohydrate, crude protein, crude fibre, moisture content) and seed oil content. The nutrient content was significantly ($P<0.05$) affected by urea fertilizer. The Pumpkins were found to be rich in Carbohydrates, Protein, Fiber, Moisture and Seed Oil. The distribution of Carbohydrate, Protein and other nutrients in the pumpkin pulp and seeds was influenced by Urea fertilizer. The interactions of Mgbom Accession x120kgN/ha, Isuochi Accession x 180kgN/ha, Isuochi Accession x 120kgN/ha, Isuochi Accession x 180kgN/ha, and Ndioru Accession x 60kgN/ha gave high nutritional values on Carbohydrate, Protein, Crude Fiber, Seed oil, and Moisture contents, respectively. The variations in the chemical contents of the Pumpkins were small, because the C.V. % values of all the chemical constituents were below 7%.

Keywords: Accessions of pumpkin, Nutrient composition and Urea Fertilizer

Introduction

Pumpkin (*Cucurbita pepo* L.) belongs to the family *Cucurbitaceae*. The family consists of two well defined sub-families, eight tribes, about one hundred and eighteen genera and eight hundred and twenty five species (Jeffrey, 1990). Pumpkin (*Cucurbita pepo*) is less heat resistant than *Cucurbita moschata* and for that reason less appropriate for tropical Africa, yet it is grown on a limited scale in all countries. Optimum growth occurs between 24^0C to 29^0C. Pumpkin is adapted to a wide variety of soil types which have good drainage and slight acidity. It is a typical vegetable of warm temperate and cool tropical areas. Most species are monoecious with male and female flowers borne separately on the same plant (Omafra, 2000). Most pumpkin seeds are covered by a white husk, although, some pumpkin varieties produce seeds without the white husk. Traditionally, *Cucurbita pepo* generally weighs between 2.7 to 8.2kg, though the largest cultivars of specie *Cucurbita maxima,* regularly weighs over 34kg (Gong et al., 2012).

Pumpkins are grown all round the world for variety of reasons varying from agricultural purpose such as animal feed to commercial and environmental scales (Wolford and Bank Drusilla, 2008). The flesh of pumpkins contain carbohydrate (6.5g), protein (1.0g), fat (0.1g), dietary fiber (0.5g), sugar (1.36g), vitamin C (9 to 20 $mg \cdot 100g^{-1}$),thiamine (0.05 mg) riboflavin (0.11 mg), niacin (0.6 mg), vitamin B6 (0.06 mg), folates (0.16 to 0.20 µg), vitamin E (1.06 mg) vitamin K (1.1 µg), β-carotene (2 to$10mg \cdot 100g^{-1}$), and other nutrients like potassium (340mg), phosphorus (44mg), magnesium (12mg), and iron (0.8mg) (USDA National Nutrient Database, 2006).In Nigeria, pumpkin is a very important traditional crop that is widely grown for the leaves, fruits and seeds. The pulp of *C. pepo* fruit is used to relieve intestinal inflammation or enteritis, dyspepsia and stomach disorders (Sentu and Debjani, 2007). Pumpkin seeds yield 34 to 54% of oil, which has been produced in Austria, Slovenia and Hungary (Murkovic et al., 1996).

Fertilizer application is important in the production of pumpkin. Urea fertilizer is one of the essential elements required by plants in large amount but it is often susceptible to losses through leaching and volatility (Singh et al., 2003). Hence, most tropical soils are deficient in essential nutrients particularly nitrogen and phosphorus (Obalum et al., 2012). Despite the importance of pumpkin in Nigeria diet, farmers are facing a lot of challenges concerning its production. Yield and quality of leaves and fruits relied upon by farmers are usually lower than what is being reported under experimental conditions (Fashina et al., 2002), which is probably due to lack of appropriate fertilizer recommendation rates and other cultural activities including the type of seed used. Pumpkin is among the most important crop plants supplying humans with edible products and useful fibers (Smith, 1997). Pumpkin is cultivated and consumed widely among the rural dwellers in south eastern Nigeria where the mature fruits serve as food during the dry season because of its long shelf life. This crop is cultivated without looking at the nutritional value. Research efforts are therefore required to recommend fertilizer requirement and accessions of pumpkin that are better for maximizing good nutritional value.

Materials and Methods

Experimental Design

Field experiment was conducted at the teaching and research farm, Department of Horticulture and Landscape Technology, Akanu Ibiam Federal Polytechnic, Unwana, Ebonyi State during the long rain season, 2023. Unwana is located on latitude 06^0 05'N and longitude $08^0$03'E with an elevation of 300m sea level (NIMET, 2014). The study area is located in a humid tropical climate with annual rainfall greater than 2500mm and temperature ranging from 32^0C to 38^0C (Njokuet al.,2006).Accessions of pumpkin were collected from twenty different areas of five south eastern State of Nigeria (Abia, Anambra, Ebonyi, Enugu and Imo States). After the collection, the

accessions were first characterized according to source/place of collection, State, local government area and size of seeds (Table 1).

The research field was measured, 199.5m long and 19m wide, giving an area of 3790.5m^2 (0.37905ha). The marked area of land was cleared, ploughed and harrowed using a tractor. Plots measuring 5m x 2m (10m^2) were marked out, beds were made manually using hoes and was raised 30cm high.

Table 1: Description of 20 Accessions of Pumpkin collected from South-Eastern States of Nigeria by Source/place, State, Local Government Area and Size of Seeds

S/No	Source/Place	State	L.G.A.	Size of Seeds
1	Abba	Anambra	Njikoka	Small
2	Agbaja	Enugu	Udi	Big
3	Amokwe	Enugu	Nsukka	Big
4	Amachi	Ebonyi	Afikpo North	Small
5	Amechi	Imo	Ideato South	Small
6	Ehime	Imo	Mbano	Big
7	Inyi	Enugu	Oji River	Small
8	Isiagu	Ebonyi	Ivo	Small
9	Isuochi	Abia	Umunneochi	Small
10	Lilu	Anambra	Ihiala	Small
11	Mgbom	Ebonyi	Afikpo North	Small
12	Ndioru	Abia	Ikwuano	Small
13	Omasi	Anambra	Anyamelum	Small
14	Omege	Ebonyi	Abakaliki	Small
15	Opi	Enugu	Nsukka	Big
16	Orlu	Imo	Orlu	Big
17	Oror	Abia	Arochukwu	Small
18	Ugwuoba	Enugu	Oji River	Big
19	Umudioka	Anambra	Dunukoka	Small
20	Umulolo	Imo	Okigwe	Small

Soil samples was collected at random from twelve representative locations of the experimental plots with soil auger at a depth of 20cm and samples was bulked into a composite sample from which sub-samples were taken for laboratory analyses for chemical and physical properties of the soil. The research was conducted as a 4 x 20 factorial laid out in randomized complete block design (RCBD). Each treatment was replicated three times and the treatment was comprise of four rates of urea fertilizer (0, 60, 120 and 180kg/ha) and twenty accessions of pumpkin. The research field was divided into three equal blocks and each block consists of eighty plots, giving a total of two hundred and forty plots. Pumpkin seeds were extracted from healthy pods collected from different areas in five south eastern states of Nigeria. The twenty accessions of pumpkin were sown in six rows per plot at spacing of 0.9m x 0.9m. Urea fertilizer was applied at four rates of 0, 60, 120 and 180kg/ha. It was applied three weeks after planting. Weeding was controlled manually using hoe about three times to minimize the effect of weeds on the plant. Zap insecticide was used to control insects and pests attack. Harvesting of pumpkin was commenced at 13th to 17th week after planting (WAP) and was done by hand plucking.

Laboratory Analysis

The chemical analyses of the accessions for carbohydrate, crude protein, crude fiber, moisture and seed oil contents were determined at the Laboratory unit of National Root Crop Research Institute, Umudike, Umuahia, Abia State. The eighty treatment combinations (4 x 20) of 20Accessions of pumpkin as affected by four (4) rates of urea fertilizer samples were dried in an oven at 70^0C for 48 hours. The pulp and seeds of each sample were ground to pass through 1mm sieve in order to provide enough surface area for thorough action of solvents and reagents to be used. The ground samples were preserved in cellophane bags and kept in desiccators**.** Eighty treatment compositions (4 x 20) of twenty accessions of pumpkin as affected by four rates of urea fertilizer samples were prepared for proximate composition on carbohydrate, crude protein, crude fiber, moisture content and seed oil contents. Carbohydrate determination on the pulpwas determined by the method described by AOAC (2005).Crude protein determination on the pulp: was determined by the micro Kjedahl method as described by Pearson (1976).Crude fiber, moisture content on the pulp and seed oil determination: to be determined by using Soxhlets extractor as described by AOAC (1995).

Data Analysis

Data collected on Chemical constituents were subjected to analysis of variance for completely randomized design (CRD) procedure of the form shown in Table 2 using Genstat Software (GENSTAT, 2014). The chemical constituents (carbohydrate, crude protein, crude fiber, moisture content and seed oil contents) means were compared using Fishers Least Significant Difference as outlined by Obi (2012).

Table 2: Form of Analysis of Variance for a Completely Randomized Design (CRD), showing Sources of Variation, Degrees of Freedom (D.F.), General and Specific

Sources of Variation	d.f. (General)	d.f. (Specific)
Accessions	a - 1	14
Error	a(r - 1)	15
Total	ar- 1	29

Replications/Samples = 2

Results and Discussion

Pre-planting Soil Physico Chemical Properties before the Experiment

The low soil pH 5.80 showed that the soil was acidity. This is in line with the report of Azuet al.(2017) who reported high acidity in most soils of Ebonyi State. According to Azuet al.(2018), the high concentration of oxides of iron and aluminum coupled with the presence of 1:2 clay minerals in the clay fraction of most hydromorphic soils of Ebonyi State is responsible for high exchangeable acidity and pH as observed in the study. Total nitrogen and available phosphorus were low and below the critical level of 0.15% and 12mg/kg as proposed by Osodeke & Ubah (2005). The organic carbon and organic matter were low indicating low soil fertility. Generally, the basic cations, except Calcium were low which might be responsible for the high pH.

Table 3: Pre-planting Soil Chemical and Physical Properties of the Experimental Plots

Constituents	Quantities
pH	5.80
Total N (g/kg)	1.50
Available P (mg/kg)	7.80
Organic Carbon (g/kg)	14.3
Organic Matter (g/kg)	24.9
Ca^{2+} ($Cmolkg^{-1}$)	3.00
Mg^{2+} ($Cmolkg^{-1}$)	1.00
K^{+} ($Cmolkg^{-1}$)	0.32
Na^{+} ($Cmolkg^{-1}$)	0.02
ECEC ($Cmolkg^{-1}$)	7.16
Exchangeable Acidity ($Cmolkg^{-1}$)	2.82
BS (%)	60.11
Sand (g/kg)	380
Silt (g/kg)	140
Clay (g/kg)	480
Textural Class	Clay Loam

Carbohydrate Content (%)

Percentage carbohydrate content of 20 Accessions of pumpkin as influenced by urea fertilizer rates (Urea) showed very highly significant differences at P = 0.01. At 0, 60, 120, and 180kgN/ha, the accessions, Agbaja, Omege, Mgbom and Agbaja/Mgbom produced the highest carbohydrate contents 12.28%, 12.67%, 13.47% and 12.95%, respectively and they differed from other accessions (Table 4). However, at 0kgN/ha Agbaja accession (12.28%) had the same carbohydrate content produced by Amokwe (12.27%). Amachi (10.72%), Orlu (11.16%), Orlu (11.56%) and Amachi, Ehime and Oror accessions (12.05%) produced the least carbohydrate content (Table 4).

Table 4: Percentage Carbohydrate Content of 20 Accessions of Pumpkin as affected by Four Rates of Urea Fertilizer (kg/ha)

Accessions of Pumpkin	Urea Fertilizer Rates (kg/ha)			
	0	**60**	**120**	**80**
Abba	12.20	11.17	12.04	12.20
Agbaja	12.28	12.28	12.50	12.95
Amachi	10.72	12.17	12.32	12.05
Amechi	10.71	12.15	12.37	12.10
Amokwe	12.27	12.14	12.34	12.41
Ehime	12.12	11.90	12.17	12.05
Inyi	11.56	12.45	12.02	12.60
Isiagu	10.73	12.14	12.30	12.55
Isuochi	10.78	12.05	11.97	12.19
Lilu	10.91	11.10	11.55	11.83
Mgbom	11.56	12.25	13.47	12.95
Ndioru	12.17	12.50	12.25	12.56
Omasi	11.36	12.46	12.83	12.56
Omege	11.45	12.67	12.85	12.65
Opi	12.13	12.11	12.11	12.56
Orlu	10.92	11.16	11.56	11.85
Oror	12.11	12.40	12.14	12.05
Ugwuoba	11.25	12.31	12.67	12.51
Umudioka	11.23	12.32	12.60	12.50
Umulolo	11.01	12.25	12.41	12.41
C.V. (%)	**0.20**	**0.30**	**0.10**	**0.20**
$LSD_{0.05}$	**0.05645**	**0.06961**	**0.03256**	**0.05706**

Crude Protein Content (%)

The result showed very highly significant (P = 0.01) effect on all rates of urea fertilizer assessed (Table 5). At 0kgN/ha, the accession, Mgbom, gave the highest crude protein content (40.88%) whereas, Orlu accession recorded the least protein content (22.62%) and they differed significantly from each other. Isuochi, Omasi and Isuochi accessions under 60kgN/ha, 120kgN/ha and 180kgN/ha produced the highest protein content; 31.97%, 31.44% and 42.13%, respectively that differed significantly from the least crude protein produced at Ndioru accession (16.28%), Amachi accession (21.42%) and Ehime accession (27.40%) at 60kgN/ha,120kgN/ha and 180kgN/ha, respectively. This crude protein values differed favorably with the crude protein values reported for yam (7.31% and 9.67%), *Zanthoxylum zanthoxyloides* (Hercules Club,' Nka') (8.74%) (Nnamani et al., 2009). This is an indication that the fruits of pumpkin may be cheap source of plant protein for the marginal resource communities of Nigeria. They also stated that any plant foods that provide about 12% of their calorific value from protein are considered good source of protein. All the accessions, therefore meet this requirement with crude protein contents mentioned above.

The highest protein content produced by 20 accessions of pumpkin at the 0kgN/ha, 120kgN/ha and 180kgN/ha differed significantly from others apart from 120kgN/ha were they are statistically similar with protein content produced at Ndioru accessions (29.41%). Isuochi accession gave the highest protein content at 60kgN/ha but did not differ significantly from those protein content produced by Ehime (30.17%), Opi (31.86%), Orlu (31.57%) and Oror (30.06%) accessions (Table 5). The C.V. %, which ranged from 3.40% (0kgN/ha) to 4.7% (60kgN/ha) are small and show that the variability in accessions in percentage protein content was also small.

Table 5: Percentage Crude Protein Content of 20 Accessions of Pumpkin as affected by Four Rates of Urea Fertilizer (kg/ha)

Accessions of Pumpkin	Urea Fertilizer Rates (kg/ha)			
	0	**60**	**120**	**180**
Abba	29.00	28.05	23.50	28.00
Agbaja	29.07	29.18	23.45	28.30
Amachi	26.76	25.70	21.42	30.10
Amokwe	29.70	20.87	22.03	29.12
Amechi	28.00	20.80	21.30	28.14
Ehime	30.90	30.17	28.36	27.40
Inyi	32.95	23.83	24.34	31.99
Isiagu	31.50	25.16	30.41	29.00
Isuochi	37.80	31.97	27.55	42.13
Lilu	31.50	25.15	30.44	29.05
Mgbom	40.88	29.11	22.30	31.57
Ndioru	31.14	16.28	29.41	29.41
Omasi	31.53	25.16	31.44	29.05
Omege	31.07	24.55	21.45	27.92
Opi	30.77	31.86	24.86	29.92
Orlu	22.62	31.57	26.65	31.87
Oror	33.87	30.06	27.10	31.43
Ugwuoba	32.05	20.69	24.52	30.04
Umudioka	28.00	24.50	22.30	27.40
Umulolo	31.53	29.08	25.35	29.77
C.V. (%)	**3.40**	**4.70**	**3.80**	**3.60**
$LSD_{0.05}$	**2.287**	**2.681**	**2.030**	**2.382**

Crude Fiber Content (%)

The analysis of variance showed highly significant (P = 0.01) variation in percentage crude fiber content as affected by 0kgN/ha, 120kgN/ha and 180kgN/ha. The percentage crude fiber content of the 20 accessions was not affected when grown in 60kgN/ha. The highest crude fibre contents produced at Isuochi (13.90%), Amokwe (16.70%), Isuochi (16.80%) and Amokwe/Orlu (16.50%) across the Urea rates used, respectively were high when compared with soybean (0.2%), (Saurez *et al.*, 1999), *Talinum triangulare* (6.20%), *Piper guineeses* (6.40%), bitter leaves (*Vernonia amygdalina*), 6.5% and *Corchorus olitorius* (7.0%), (Oboh et al., 2003). The fibre content of 3.6% for cowpea (Saurezet al., 1999) and 6.31% for Pumpkin leaf extract has been reported by Nworgu et al.*(*2007).

The effects of 60kgN/ha had non-significant (P > 0.05) effect on the percentage crude fiber content of the 20 accessions. All the accessions had a mean percentage crude fiber content of approximately 16%. It appeared that the accessions performed best in 60kgN/ha. However, the C.V. (%) for the analysis was highest, 6.8% compared with C.V. % at 0kgN/ha, 120kgN/ha and 180kgN/ha of 3.2%, 2.6% and 3%, respectively. The results are presented in Table 6.

Table 6: Percentage Crude Fiber Content of 20 Accessions of Pumpkin as affected by Four Rates of Urea Fertilizer (kg/ha)

Accessions of Pumpkin	Urea Fertilizer Rates (kg/ha)			
	0	**60**	**120**	**180**
Abba	12.30	15.90	14.50	15.30
Agbaja	13.40	15.90	14.90	16.30
Amachi	12.80	15.80	13.80	15.90
Amechi	12.40	16.20	14.50	15.40
Amokwe	12.80	16.70	15.30	16.50
Ehime	13.00	14.25	13.80	16.20
Inyi	12.10	15.80	13.80	15.60
Isiagu	12.30	16.50	14.60	15.30
Isuochi	13.90	14.70	16.80	16.35
Lilu	12.40	16.30	14.50	15.60
Mgbom	12.10	16.30	14.50	16.40
Ndioru	13.60	15.60	13.50	16.25
Omasi	12.20	16.10	14.20	15.80
Omege	12.00	16.50	14.60	16.30
Opi	12.50	15.70	14.10	14.50
Orlu	12.30	16.10	13.70	16.50
Oror	12.50	16.50	13.90	16.20
Ugwuoba	12.60	16.50	14.10	15.20
Umudioka	12.40	16.30	14.40	15.30
Umulolo	12.10	16.20	14.10	15.80
C.V. (%)	**3.20**	**6.80**	**2.60**	**3.00**
$LSD_{0.05}$	**0.8683**	**(---)**	**0.7831**	**1.0198**

(---) Non-Significant Effect from the Preliminary F-test.

Moisture Content (%)

The moisture content of the evaluated accessions was significantly affected by four rates of Urea. The accessions, Orlu, Ndioru, Amachi and Ehime, had high moisture contents of 54.16%, 55.62%, 52.46% and 44.35% at 0kgN/ha, 60kgN/ha,120kgN/ha and 180kgN/ha, respectively, and this could imply short shelf life. High amount of moisture content on leafy vegetables makes them vulnerable to microbial attack, hence, spoilage. The moisture content of any food is an index of its water activity and is used as a measure of stability and the susceptibility to microbial contamination (Scott, 1980). This high moisture content could also means that dehydration would increase the relative concentration of other food nutrient and therefore improve the shelf-life and preservation of the fruits. The relative high moisture content observed in this study is in line with the report by Umoh (1998). He reported that high moisture

content is typical of fresh fruits at maturity. Thomas and Oyediran (2008) had earlier reported 82.8% moisture content for *C. esculenta* which is comparable with the range of moisture content obtained in the study. A moisture content of 61.40% has been reported in African pear (*Dacryodes edulis*) fruit (Ibanga & Okon, 2009). The C.V. % was generally small, and ranged from 1.8% (120kgN/ha) to 2.5% at 180kgN/ha, an indication that the Accessions did not vary much in their content of the chemical measured.

Table 7: Percentage Moisture Content of 20 Accessions of Pumpkin as affected by Four Rates of Urea Fertilizer (kg/ha)

Accessions of Pumpkin	Urea Fertilizer Rates (kg/ha)			
	0	**60**	**120**	**180**
Abba	45.50	44.10	46.54	42.20
Agbaja	45.75	42.64	49.14	42.45
Amachi	50.35	46.33	52.46	41.95
Amechi	45.00	43.55	46.57	41.00
Amokwe	45.23	50.30	50.33	41.97
Ehime	43.98	43.68	45.67	44.35
Inyi	43.39	47.92	49.84	39.81
Isiagu	45.20	44.45	44.34	39.34
Isuochi	37.52	41.28	43.68	29.33
Lilu	44.45	43.45	45.67	39.00
Mgbom	35.47	42.34	49.74	39.08
Ndioru	43.09	55.62	44.84	41.78
Omasi	44.91	46.28	41.53	42.59
Omege	45.48	46.28	51.10	42.98
Opi	44.60	40.33	48.93	42.75
Orlu	54.16	41.17	48.09	39.78
Oror	41.53	41.04	46.86	40.32
Ugwuoba	44.10	50.50	48.71	42.25
Umudioka	44.20	45.43	44.00	42.00
Umulolo	44.55	42.47	48.14	42.02
C.V. (%)	**2.20**	**1.90**	**1.80**	**2.50**
$LSD_{0.05}$	**2.047**	**1.820**	**1.860**	**2.196**

Seed Oil Content (%)

There was a significant (P = 0.01) differences in seed Oil content among 20 Accessions of pumpkin under four rates of urea fertilizer investigated (see Table 8). The accession, Opi, produced the highest percentage oil content (23.62%), which differed from the other accessions studied at 0kgN/ha except Oror (23.11%). Isuochi accession produced highest oil; 23.78%, 29.31% and 30.15% at 60, 120 and 180kgN/ha, respectively whereas, Ehime accession (14.72%), Umulolo accession (18.87%) and Inyi accession (18.44%) gave the least oil content at 60, 120 and 180kgN/ha, respectively, and they differed significantly. Extending to 180kgN/ha increases the oil contents in seeds than the control treatment. This is inconformity with the work done by Aroiee & Omidbaigi (2002).

Table 8: Percentage Seed Oil Content of 20 Accessions of Pumpkin as affected by Four Rates of Urea Fertilizer (kg/ha)

Accessions of Pumpkin	Urea Fertilizer Rates (kg/ha)			
	0	**60**	**120**	**180**
Abba	16.00	23.00	24.56	24.50
Agbaja	11.27	21.25	22.33	20.59
Amachi	18.17	23.36	21.45	19.86
Amokwe	19.27	23.40	22.31	24.42
Amechi	19.34	23.00	25.16	34.56
Ehime	19.27	14.72	25.17	21.43
Inyi	21.27	22.13	22.37	18.44
Isiagu	20.45	22.15	23.00	24.00
Isuochi	21.30	23.78	29.31	30.15
Lilu	21.00	21.36	22.34	26.45
Mgbom	21.32	21.67	22.61	22.80
Ndioru	18.17	21.14	21.16	20.67
Omasi	13.73	16.34	21.72	21.67
Omege	21.77	18.25	23.57	22.33
Opi	23.62	23.56	25.77	23.33
Orlu	21.37	21.36	23.43	23.08
Oror	23.11	23.28	24.22	29.87
Ugwuob	19.30	21.46	21.33	22.89
Umudio	20.10	21.67	23.78	24.60
Umulolo	16.97	19.70	18.87	21.43
C.V. (%)	**1.90**	**0.20**	**1.10**	**2.40**
$LSD_{0.05}$	**0.764**	**0.094**	**0.546**	**1.156**

Conclusion

We conclude that the variations in the chemical contents of the Accessions were small, because the C.V. % values of all the chemical constituents were below 7%. From the results of this study, For maximum production of carbohydrate, crude protein, crude fibre, seed oil and moisture content, urea fertilizer at the rates of 120, 180, 120, 180 and 60kg/ha, respectively should be used.

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