

Effect of planting date on the yield and proximate composition of pumpkin (*Cucurbita pepo* Linn.) fruit

OLOYEDE F.M.*

Department of Crop Production and Protection
Obafemi Awolowo University
Ile-Ife, Nigeria.

* Corresponding Author: Email address: funmilayooloyede@yahoo.co.uk

ABSTRACT

Cucurbita pepo commonly known as pumpkin belongs to the Cucurbitaceae family. Pumpkin is underutilized in Nigeria, for a successful exploitation of this plant, information on planting date as well as the food value is crucial. This work aimed at determining the effects of planting date on the yield and proximate composition of pumpkin. Studies were carried out in 2007 and 2008 at the Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife, Nigeria. The experiment was a randomized complete block design (RCBD). The planting dates were: 1st and 15th of April and 1st and 15th of May. The plot size was 8 m x 4 m and the plants were spaced 2m x 2m. The experiment was replicated thrice. The data collected, were subjected to analysis of variance. Means, where significantly different, were separated using Duncan Multiple Range Test (DMRT) at 5% level of probability. The yields of the crops planted on the 1st and 15th of April were not significantly different but significantly out-yielded (53.56 and 49.93 tons ha⁻¹ respectively) every other crop planted subsequently. The 1st planting date produced significantly highest protein (17.98 g 100g⁻¹), crude fibre (1.90 g 100g⁻¹) and ash (3.9 g 100g⁻¹), compared to other planting dates. In conclusion, the plants under the 1st planting date performed best, yielded optimally and had highest food value.

Key words: Planting date; proximate; pumpkin; yield.

1. INTRODUCTION

Cucurbita pepo Linn belonging to the cucurbitaceae family is originated from North and Central Americas, where it has been reported to have variety of uses ranging from domestic to medicinal. Pumpkin has been an important food in Mexico for centuries. Fruits are processed and consumed in variety of ways. Commercially canned pumpkin pie mix may be made of *C. pepo*. Nearly nature fruits are stuffed with meat and other ingredients and then baked. The immature fruits are eaten. In the USA, the most familiar use of pumpkins is for Halloween - Jack -O' - lanterns. Every autumn, the orange, round or oval fruits are carved into grotesque faces and illuminated from within the candles. The fruits flesh of wild species generated a saponin-rich froth when robbed, and has been employed to wash clothes. Native American dried strips of pumpkin flesh in the sun for preservation. Pumpkin is usually cooked today by boiling or drying (Robinson and Decker -Walters, 1997). Pumpkin is a gentle and safe remedy for a number of complaints.

Information is scarce in the literature on the agronomic requirement and food value of pumpkin in the tropics, especially in Nigeria. A major step in the development of agronomic package for a new crop involves determination of appropriate planting dates or a range of dates during which optimum yield and optimum fruit quality can be guaranteed. This is a very important aspect of this research especially now when climate change is a major world problem. Planting date has been reported to influence the yield and chemical composition of crops (Adebooye 2001; Konova and Rainova 1981; Oloyede and Adebooye 2005). This study therefore investigated the effect of planting dates on the yield and proximate composition of *C. pepo* fruit.

2. MATERIALS AND METHODS

Studies were carried out in 2007 and 2008 at the Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife, Nigeria. The plants were raised directly from seeds. Two seeds were planted per hole. A week after emergence, seedlings were thinned to one per hole on the basis of

visual observation of vigour. The experiment was a randomized complete block design. The planting dates were: 1st and 15th of April and 1st and 15th of May. The plot size was 8 m x 4 m and the plants were spaced 2m x 2m. The experiment was replicated thrice. Weed control was effected manually using hoe and cutlass and using herbicide (Glyphosate). Insecticide (lambda-cyhalothrin) was applied weekly immediately the plants started flowering.

2.1 Data Collection

Data were collected from the middle row while the first and third rows served as guard rows.

Data were collected on the following traits:

Number of fruits per plant: The number of marketable fruits were taken and recorded.

Fruit diameter: This was measured using graduated ruler

Fruit length: This was also measured using graduated ruler

Average fruit weight: This was taken per plot after harvest

Weight of seeds/fruit: Four fruits were selected per plot and the average found

Number of seeds/fruit: Four fruits were selected per plot and the average found

Fruit yield: Fruits harvested from the middle row per plot were weighed and converted to yield per hectare using:

$$\text{yield (tons/ha)} = \frac{\text{weight / plot (kg)} \times 10,000 \text{ m}^2}{\text{Area of plot (m}^2\text{)} \times 1,000 \text{ kg}}$$

$$1,000 \text{ kg} = 1 \text{ ton and } 10,000\text{m}^2 = 1\text{ha}$$

2.2 Laboratory analyses

After harvest., fruit samples were analyzed for protein, fibre, moisture, carbohydrate, ash and fat contents following the routine chemical analytical methods (AOAC, 1995).

2.3 Statistical analysis.

The data collected, were subjected to analysis of variance (SAS, 2003). Means, where significantly different, were separated using Duncan Multiple Range Test (DMRT) at 5% level of probability.

3. RESULTS

3.1 Effect of planting date on fruit yield and yield parameters of pumpkin

Table 1 showed that the number of marketable fruits and fruit yield reduced significantly as planting dates were delayed. The number of marketable fruits (14/plot) was highest in the first planting date, it reduced by 7% at the 2nd planting date while at the 3rd and 4th planting dates the reduction was by 57% and 93% respectively. Consequently, the fruit yield was also highest in the first planting date followed subsequently by other planting dates. There was no significant difference in the fruit yield of the first and second planting dates. Mean fruit yield of planting dates 1 and 2 was (52 tons/ha). This reduced by 60% at the 3rd planting date and 92% at the 4th planting date. The yield was lowest in the fourth planting date (4 tons/ha). There was no significant difference in the fruit diameter, fruit length and number of seed per fruit among the planting dates. The weight of seed per fruit was highest in the first and second planting dates, though the weight did not differ significantly between the dates. Seed weight per fruit was lowest in the 3rd and 4th planting dates and were also similar at the same dates.

2.2 Effect of planting dates on the proximate composition of pumpkin fruits

The effect of planting date on the proximate composition of pumpkin is presented in Table 2. The results showed that planting dates have significant effect on the protein, ether extract (fat), crude fibre and carbohydrate contents of pumpkin fruits, but did not influence moisture and ash contents significantly. The protein and crude fibre contents decreased significantly as planting date was delayed. While, the Carbohydrate contents increased significantly as planting date was delayed. The highest crude fibre content was found in the 1st planting date (18%), this reduced by 22% at

Table 1: Summary of weather data at Ile-Ife, Osun-State during the Cropping years (2007 and 2008)

Months	2007 Total Rainfall/month (mm)	2008 Total Rainfall/month (mm)
January	NR	0.0
February	NR	0.0
March	NR	41.7
April	116	238
May	165.3	51.3
June	218.8	193
July	182.6	313.1
August	188.2	255.5
September	207.7	273.8
October	218.9	160
November	36.3	0.0
December	24.7	31.1

NR = Not recorded

Source: Nigerian meteorological agency

142

Table 2: Effect of planting date on fruit yield and yield components

Planting date	Number of marketable fruits	Fruit yield (tons ha⁻¹)	Fruit diameter (cm)	Fruit length (cm)	Number of seed fruit⁻¹	Weight of seed fruit⁻¹
1	14.11a	53.56a	12.78a	16.78a	336.35a	70.25a
2	12.53b	49.93a	12.28a	16.75a	334.29a	71.99a
3	5.65c	21.27b	12.24a	16.35a	332.38a	64.74b
4	1.38d	4.17c	12.12a	16.15a	331.71a	61.82b

143

144 Values are means of data obtained in 2007 and 2008

145 Means with the same letter in each column are not significantly different at 5% level of Probability using Duncan's Multiple range test.

146

147

148

149

150

151

152

153

154

155

156 **Table 3: Effect of planting date on Proximate Composition of Pumpkin fruit (Dry weight basis)**

Planting date	Crude protein	Moisture	Ether extract g/100g	Ash	Crude fibre	Carbohydrate
1	17.74a	1.87a	2.89b	3.78a	1.95a	71.77d
2	16.50b	1.89a	2.70b	3.68a	1.85a	73.38c
3	14.22c	1.84a	3.28a	3.19a	1.83a	75.65b
4	13.59d	1.85a	3.55a	3.36a	1.39b	77.65a

157
158
159 Values represent means of duplicate of 3 composite samples for each treatment.

160
161 Means with the same letter in each column are not significantly different at 5% level of Probability using Duncan's Multiple range

planting dates 3 and 4 and by 5% at planting date 2. Fat content was similar between planting dates 1 and 2 and between planting dates 3 and 4 but lowest in 1 and 2. Crude fibre was similar in planting dates 1 to 3 while it was lowest in the last planting date.

4. DISCUSSION

Precipitation is the source for all soil moisture in rain fed cropping systems. Generally, as plants extract water from the soil, any change in the quantity of precipitation will affect the supply of soil moisture, thereby impacting final crop yield. If soil moisture is insufficient to meet the evaporative demand imposed by the atmosphere, the leaves of the plant lose turgor and the stomata close. As a result, the entry of CO₂ into the stomata is inhibited and photosynthesis is reduced, impacting biomass production, crop growth, partitioning to vegetative and reproductive structures and final yield (Alexandre *et al.*, 2002). In this study, the result of the effect of planting dates on fruit yield and nutrient profile of pumpkin fruits was consistent with earlier findings on similar crops (Oloyede and Adebooye, 2005). The level of management practices has been shown to affect crop quality. Lu *et al.* (2003) found that high input management practices in watermelon produced greater marketable yield, higher number of marketable fruit/plant, and higher fruit weight than did low input management practices. Leskovar *et al.* (2004) reported that yield was affected by deficit irrigation in watermelon while lycopene was higher during deficit irrigation. The crops planted in May in this study received more rainfall compared to those that were sown earlier. Low rainfall favoured pumpkin fruit yield and was highly depressed by much rainfall. In the same way, crops that received lesser rainfall also had higher protein content. This might be as a result of pumpkin's ability to resist drought. Konova and Rainova (1981) reported that soybean that received less water had higher crude protein and lower pH. They also stated that when moisture is high, the cell plasma is dilute; protein forming enzymes are retarded thus reducing protein synthesis. Matsuzoe *et al.* (1998) demonstrated that deficit irrigation in tomatoes increased lycopene and total carotenoid content. Climatic factors vary with growing site, during the season and from year to year. Temperature, both in terms of total or average temperature

and the extremes during the growth period, may influence the chemical composition (Weston and Barth, 1997; Lefsrud *et al.*, 2005).

5. CONCLUSION

Planting date had a significant effect on the total fruit yield of *C. pepo*. As the planting date was delayed, total fruit yield decreased. As the planting date was delayed also, the food value of *C. pepo* fruits reduced with the exception of carbohydrate. The first planting date (April 1st) or early planting is therefore suggested for the cultivation of *C. pepo*.

ACKNOWLEDGEMENT

The contribution of Prof. O.C. Adebooye to this work is well acknowledged.

COMPETING INTEREST

No competing interest exists.

REFERENCES

- Adebooye, O.C. (2001). Effects of intra-row spacing and phosphorus levels on growth and post-harvest qualities of fruits of three varieties of tomato (*Lycopersicon lycopersicum*(L.) Karst). Unpublished Ph.D. Thesis Department of Agronomy, University of Ibadan, Ibadan, Nigeria.
- AOAC, 1995. *Official methods of analysis* (15th ed.) Washington, DC. Association of Official Analytical Chemists, 1120 pp.
- Konova, L. and Rainova, L. 1981. Chemical composition of soybean seed. In Arabadshier, C.D. Batashki, A. Goranora (eds) soyabeans. *Soyabean*, Moscow, pp. 42-54.
- Lefsrud, *et al.*, (2005). Air temperature affects biomass and carotenoid pigment accumulation in kale and spinach grown in a controlled environment. *Hortscience*, 40, 2026-2030.

- Leskovar, *et al.*, (2004). Lycopene, carbohydrates, ascorbic acid and yield components of diploid and triploid watermelon cultivars are affected by deficit irrigation. J Hort Sci Biotech., 79, 75- 81.
- Lu, *et al.*, (2003). A comparison of yield between high- and low-intensity management for three watermelon cultivars. HortScience, 38, 351-356.
- Matsuzoe, *et al.*, (1998). Effect of soil water deficit on coloring and carotene formation in fruits of red, pink, and yellow type cherry tomatoes. J Japan Soc Hort Sci., 67, 600-606.
- Oloyede, F.M., Adebooye, O.C. (2005). Effect of season on growth, fruit yield and nutrient profile of two landraces of *Tricosanthes cucumerina* L. African Journal of Biotechnology, Kenya 4(6), 1040-1044.
- Robinson, R.W. and Decker-Walters, D.S. 1997. Cucurbits. Cab International Wallingford Oxon Ox 10 8DE, UK, pp. 1-206.
- Version 9.1. SAS Institute Inc., Cary, NC. 2003.
- Weston, L .A., Barth, M. M. (1997). Preharvest factors affecting postharvest quality of vegetables. Hort science 32, 812-816.