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# Utilization of Tender Pigeonpea (Cajanus cajan (L.) Millsp.) in Nigeria

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**Abstract**
The utilization of tender pigeon-pea as vegetable in the preparation of rice dishes was investigated. Tender pigeon-pea pods were harvested, sorted, dehulled and the seeds were washed with water. Rice dishes were prepared using tender pigeon-peas, green peas and green beans. Preparations with green peas and green beans served as the controls. Proximate analysis of the vegetables was determined. Sensory evaluation of the rice dishes were carried out by 20 panelists using a 9-point hedonic scale at $p<0.05$. Tender seeds of pigeon-pea, green beans and green peas comprised protein (6.60%, 8.40%, 5.40%), moisture (64.95%.69.92%.64.20%), fat (13.75%, 7.28%, 7.40%), crude fiber (2.95%, 3.20%, 5.1%), ash (3.92%, 3.32%, 3.40%) and carbohydrate (7.852%, 7.88%, 14.85%) respectively.The proximate composition of pigeon-pea (protein 6.60%, fat 13.75%, fiber 2.95%, and ash 3.92%) has shown that it could be a good source of fat, protein, dietary fiber and minerals. In organoleptic characteristics of the rice dishes, panelists rated the pigeon-pea samples "moderately liked" in color, aroma, texture and overall acceptability, but taste was "very much liked". Rice dishes with pigeon-peas compared favorably with green beans and green peas samples in all sensory attributes, hence tender pigeon-pea could be an alternative vegetable in preparation of rice dishes and salad.
**Keywords**: Green beans, green peas, organoleptic characteristics, pigeonpeas, rice dishes, vegetables.

## Introduction

Vegetable is defined as an edible plant or part of a plant (leaf, stem or root) other than sweet fruit or seed. Some vegetables are consumed raw while some are cooked with either savory or salty dishes to make them edible. Vegetables may be classified into four groups: green leafy vegetables, immature cereals and legumes, mature cereals and legume sprouts (peas, beans and their sprouts) and root vegetables, which include carrots, radish and rutabagas (Okaka, 2009). Some pulses are used as vegetable with or without their pods. Tender and immature pulses are cooked in whole cuisines and are sold for the purpose. For example, the black eyed beans, lima beans and pigeon-peas are thus eaten as fresh as part of a meal (Menotti et al., 2009). Pulses are important food crops due to their high protein and essential amino acid contents (Charlton and Charles, 2004). Dried pulses are used for human food and animal feed, while tender green beans and green peas are considered as vegetables. Pulses have significant nutritional and health advantages for consumers. They are the most important dietary predictor of survival in older people of different ethnicities and it was reported that legume consumption was highly correlated with a reduced mortality from coronary heart disease (Charlton and Charles, 2004). Pulses are especially high in amylose (component of starch), which make them a good source of probiotics resistant starch. A good example of a pulse is pigeon-pea (Darmadi-blackberry et al., 2004).

Pigeonpea (*Cajanus cajan*(L.) Millsp.) is a very good source of protein, vitamin C, vitamin K, folate and thiamin (Vitamin B1), vitamin A, phosphorus, vitamin B6, riboflavin (Vitamin B2), manganese, magnesium, copper, zinc, iron and potassium (Menotti et al., 1999). Pigeonpea contains essential amino acids such as methionine, lysine and tryptophan (Menotti et al., 1999). Pigeonpea is a very good source of vitamin K (and K2) which activates osteocalcin (which is the non-collagen protein in new born baby). High vitamin K2 activates high level of osteocalcin which reduces or eliminates impairment of bone mineralization (Bazzano et al., 2002). Vitamin K is also necessary for blood clotting (Ensminger and Ensminger, 1986).

Pigeonpeas when combined with cereals make a well balanced food. The pigeonpea seeds are processed and eaten in various forms in Asia, Ethiopia, Dominican Republic, as 'arroz congradules' in Puerto Rico and as a stew and eaten with plantain balls (Menotti et al., 1999). Despite its importance for nutrients and as vegetable and pulses and its food value in other countries, Nigerians are yet to utilize the pigeon-peas in their menu. In Nigeria, pigeonpea is less popular and cheaper than other legumes such as cowpea, Bambara groundnuts, soya bean, etc. The pigeonpea is relegated to the background and is mainly used as animal feed.

Therefore, the objective of this work is to utilize the tender pigeonpeas as vegetable in the production of rice dish and create awareness that pigeonpea could be used in place of green beans and green peas in preparation of rice dishes, stew and vegetable salad.

 

**Materials And Methods**

The tender pigeon-peas were obtained from the Department of Crop Science and Technology, Postgraduate and Research farm, Federal University of Technology, Owerri (FUTO). Green peas (*Pisum sativum*) and green beans (*Vigna unguiculata*) rice, vegetable oil, beef/fish and seasonings were purchased from a local market in Owerri. The chemicals used for analysis were of analytical grades. The work was carried out at the Department of Food Science and Technology, Federal University of Technology, Owerri, Imo State, Nigeria.

**Sample preparation**

The freshly harvested tender pigeon-peas, the green peas and green beans were sorted and washed to remove extraneous and unwanted portions, and then the materials were allowed to drain. Then the pigeon-peas and green peas were dehulled while the green beans were sliced into small sizes without dehulling.

**Preparation of rice dishes**

A modified recipe was used to prepare the rice dishes (Table 1 and Figure 1). The washed parboiled rice and seasoned meat were put into hot oil (in a pot) and cooked for two minutes with stirring. Then pepper, onions, salt and seasoning were added and cooked for 4 minutes.

The vegetables (pigeon pea, green beans or green peas) and rice were added and thoroughly mixed. Water was added to cover the rice (1/2 inch above). The mixture was then tasted, covered and cooked at low heat for 20 minutes.

**Sensory evaluation of rice prepared with the vegetable samples**

The assessment method described by Ihekeronye and Ngoddy (1985) was modified and used in the work. The organoleptic properties of the rice dishes were evaluated subjectively by a set of 20 panelists drawn from the University staff and students. The selection of the panelists from the University was for convenience. The panelists included untrained men and women who consumed the rice dishes with vegetables. All the samples were presented to them at the same time and the identities of the sample were not revealed to the panelists. Each panelist was provided with sufficient privacy to ensure that his/her result was arrived at independently and without being influenced by other panelists. The parameters of the samples evaluated were color, aroma, taste, texture and overall acceptability. A 9-point hedonic scale was used. The following instructions were given to the panelists:

- Testing for color: By visual inspection.
- Testing for Aroma: By sniffing two times or more a spoon full of each sample provided.
- Testing for taste: By chewing a spoonful of the sample for 1-5 minutes. Enough water was provided and the panelist was free to swallow or spit out the sample and rinse his/her mouth after each test.
- Scoring: The panelists were given rating based on 1-9 - hedonic scale; 9 - liked extremely; 8-liked very much; 7 – liked moderately; 6 – liked slightly; 5 – neither liked or disliked; 4 – disliked slightly; 3 – disliked moderately; 2 – disliked very much; 1 – disliked extremely.
- The panelists were to award a final score for overall acceptability.

**Statistical analysis**

The statistical analysis using a Completely Randomized block Design (CRD) and a one way classification model were used. Analysis of variance was done and the Friedman's multiple comparison test and Duncan grouping test (Akinjayeju 2002) at $p \leq 0.05$ (95% confidence level) were used to compare the differences and similarities between the vegetable samples (American society of brewing chemists 1987).

**Proximate analysis**

The standard methods of Association of Official Analytical Chemists (A.O, A.C 1990) were used to determine the proximate composition of the different vegetable samples. The composition analyzed includes moisture, ash, crude protein, carbohydrate, crude fat and crude fibre. Energy value (caloric value) of the sample was calculated using the Atwater quantification method as Atwater Physiological Fuel Value (PFV) where the available energy for metabolism after digestion and absorption was termed physiological fuel value using carbohydrate, fat and protein. The PFV in kcal were 4:9:4 for carbohydrate, fat and protein respectively, which was termed Total Digestible Nutrients (TDN).

Energy value = {(xg carbohydrate x 4) + (xg fat x 9) + (xg protein x 4)} kcal.

Where x is the quantity of a particular nutrient.

**Results and discussion**

The proximate composition of the vegetable samples is shown in Table 2. There were no significant differences in the moisture, ash, crude fiber and carbohydrate content of the pigeon-pea, green pea and green beans.The

 

protein content of green beans (8.40%) was higher than those of pigeon-pea (6.60%) and green peas (5.40%), but was significantly similar to pigeonpeas. The fat content of pigeon-pea (13.75%) was approximately two times higher than the values for green peas (7.40%), green beans (7.28%). Also the carbohydrate content of green peas (14.50%) was approximately 100% more than those of pigeonpea (7.83%) and green beans (7.88%). The energy value for pigeonpea was greater than those of green peas and green beans. This difference may also be due to maturity as the age of the vegetables was unknown though they were tender. From the proximate composition, these vegetables could be used as sources of dietary fibre and ash.

The mean values of the sensory parameters are shown in Table 3. The color, taste and aroma of the rice dishes were significantly similar. This is because the green vegetables gave the dishes attractive and appetizing color.

The color of the rice dish prepared with green peas, and green beans had the highest mean value (score approximately 8.0) which was 'very much liked'. The dish prepared with pigeonpea was 'moderately liked' (score approximately 7.0). The high rating of green peas and green beans could be due to the fact that the panelists were already familiar with rice dishes prepared with these vegetables. The 'moderately liked' rating of pigeonpea rice dish by the panelists could be due to its light green color.

The aroma of the samples prepared using pigeon-peas was significantly similar though the aroma of sample prepared with green peas received the highest rating of 'very much liked' (score approximately 8). This was followed by Pigeonpea which was 'moderately liked' (score approximately 7.60), while green beans was only 'slightly liked' (score approximately 6.0). There were no significant differences in the taste of all the samples as they were 'very much liked' (score approximately 8.0).

The texture of green peas was rated highest ('very much liked score' approximately 8.0) and was significantly different from the rest of the samples which were 'slightly liked' for green bean and 'moderately liked' for pigeonpeas. In overall acceptability, green peas received the highest rating of 'very much liked'; followed by pigeonpeas (score approximately 6.0). In fact, there were significant differences in overall acceptability of the rice dishes prepared by the vegetables (Table 3).

**Conclusions**

The proximate composition of pigeon-peas has shown that it could be a good source of fat (polyunsaturated fatty acids), protein, dietary fibre and ash (minerals) if used as vegetables in dish preparations. The proximate composition values obtained from this work were comparable to green peas and green beans commonly used in preparation of rice dishes. Panelists rated the pigeonpea samples 'moderately liked' in color, aroma, texture and overall acceptability but 'very much liked' in taste. This implied that pigeonpea could be used in place of green peas and green beans in rice dishes and vegetable salad. This will help to reduce the price of green peas and green beans in the market as pigeon pea becomes their alternative. Also, the introduction of pigeonpea as vegetable to our restaurants and eatery houses will add varieties to common Nigerian cuisines while providing the needed nutrients. This work will also boost the production of pigeonpeas by farmers and enhance their income and value addition on pigeonpea. The variety of pigeonpea used in this work grows very well in the Eastern States of Nigeria and hence will reduce the post harvest losses encountered during transportation of green beans and green peas from the Northern part of the country to the Eastern part.

Table 1. Recipe for preparation of rice dishes with the vegetables (green beans, green peas and pigeon-peas)

| **Ingredient** | **Quantity (g)** |
|---|---|
| Vegetable | 50 |
| Rice | 150 |
| Beef | 350 |
| Onions | 1 size bulb |
| Pepper | 1 tea spoonful |
| Sauces | 1 table spoonful |
| Salt | 1 tea spoonful |

 

Table 2. Mean values of the proximate composition of pigeon-pea, green peas and green beans.

| | Proximate composition (%)* | | | | | | |
|---|---|---|---|---|---|---|---|
| Vegetable Sample | Moisture | Protein | Fat | Crude fibre | Ash | Carbo-hydrate | Energy (kcal) |
| Pigeon-peas | 64.95±1.234[a] | 6.6±0.98[a] | 13.75±2.21[a] | 2.95±0.12[a] | 3.92±0.14[a] | 7.83±1.23[b] | 181.47 |
| Green Peas | 64.2±1.14[a] | 5.4±1.15[b] | 7.4+2.35[a] | 5.1±0.98[a] | 3.94+0.70[a] | 14.5±2.35[a] | 146.20 |
| Green Beans | 69.92±1.13[a] | 8.4±0.65[a] | 7.28+1.16[a] | 3.2±0.77[a] | 3.4+0.50[a] | 7.88±1.82[b] | 130.64 |
| LSD | 2.34 | 3.25 | 5.5 | 1.13 | - | 5.52 | - |

* Mean values with different superscripts within the same column are significantly different at (P< 0.05) while the similar superscript means no significant difference.

Table 3. Mean values of organoleptic characteristics of the rice dishes prepared with pigeon-peas, green Peas and green Beans.

| | Sensory characteristics* | | | | |
|---|---|---|---|---|---|
| Rice Samples prepared with Vegetables | Colour | SensoryTaste | Aroma | Texture | Overall Acceptability |
| Green Peas | 8.07 +0.80[a] | 8.33 +0.72[a] | 7.60+0.74[a] | 8.13+0.74[a] | 8.20 +0.78[a] |
| Green Beans | 7.7 + 1.03[a] | 7.73 +0.70[a] | 6.20+0.86[a] | 6.2+0.86[b] | 6.20+0.86[c] |
| Pigeon-peas | 6.53+ 1.06[a] | 7.60 +0.74[a] | 6.73+1.22[a] | 6.47+0.64[b] | 6.47 +0.74[b] |
| LSD | 0.86 | - | 0.88 | 1.07 | 0.18 |

* Mean values with different superscripts within the same column are significantly different at (P< 0.05) while the similar superscript means no significant difference.

 

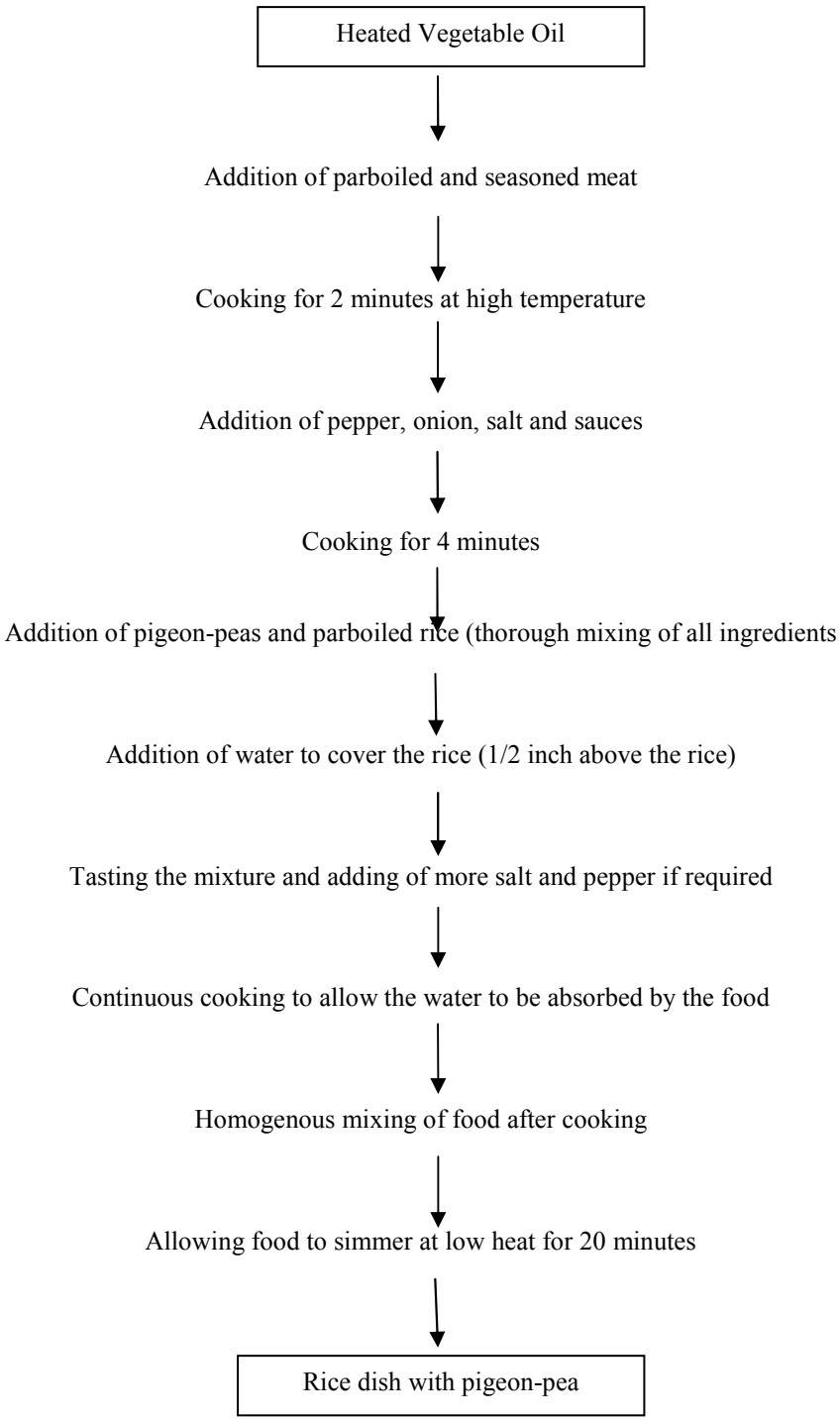


Figure 1. Flow diagram for the preparation of rice dish with pigeon-peas as vegetable.

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