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# Effects of pre-treatments on chemical composition of sweet potato flour using different drying methods

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**Abstract**
Sweet potato (*Ipomoea batatas*, Convolvulaceae), a perennial crop grown in tropical and subtropical lowland agro-ecologies, is a high-energy crop with more edible energy per hectare per day than cereals. Despite its high carbohydrate content, sweet potatoes have a low glycemic index, making them suitable for diabetics and obese people. The goal of this study was to see how pre-treatment and drying methods affected the chemical composition of sweet potato flour. Four pre-treatment methods (soaking in water, TR1; blanching, TR2; calcium chloride solution, TR3 and pre-drying at 60 °C for 30 minutes, TR4 along with the control, TR5) and three drying methods (sun drying, DR1 oven drying, DR2 and microwave drying, DR3) were employed in the preparation of flour from three varieties of sweet potato (Dergaon red, Shree Bhadra and ST-14). All the pre-treatment methods and the drying methods were found to affect significantly. Orange fleshed variety; ST-4 was found nutritionally superior over the other two. All the pre-treatments caused significant reduction in the nutritional parameters compared to control with TR4 being the worst. Sun drying was found better in maximum retention of crude protein, crude fat, starch and amylose over the other two. Microwave drying was found better for crude fibre and ash content. Being orange fleshed, ST-14 had the highest β-carotene content and sun drying was found as the best. The interactive effect of variety, pre-treatment and drying method was found to have a significant effect in all the attributes of sweet potato flour.

**Keywords:** Drying, Food quality, Pretreatment, Sweet potato flour, Variety

## 1. Introduction
Sweet potato (*Ipomoea batatas* L. Lam.) is a common staple meal in many tropical and subtropical underdeveloped countries. It's a perennial crop that's used as a source of food, animal feed, and industrial raw materials. There are many different sweet potato types, each with its own colour of flesh and root skin, among other characteristics. [1]. Sweet potato is cultivated extensively for its nutritious and health-promoting values [2]. Contribution of sweet potato towards health is acknowledged due to high nutrient content and its anti-carcinogenic and cardiovascular disease preventing properties [3]. Sweet potato is a significant protein source for many people throughout the world, as well as a good source of starch and other carbs that the human body need. Sweet potatoes are high in vitamin C, $B_2$, $B_6$, and E, as well as dietary fibre, potassium, copper, manganese, and iron, and are low in fat and cholesterol in almost all cultivars. In terms of worldwide output, sweet potatoes are the sixth most significant crop. It ranks third in terms of outputvalue and fifth in terms of caloric contribution to the human diet in developing countries [4]. Roots, stems, and leaves of sweet potatoes are the edible parts with varying composition of nutrients, bio actives, non-nutrients, and antinutrients.

Sweet potato is one of the world's highest yielding crops and is grown over a wide range of environmental conditions, including land of low fertility and in near drought conditions. The enlarged adventitious roots produce the underground tubers of varying shapes and colours. Roots of sweet potato are consumed in a variety of means. Most sweet potatoes are commonly consumed fresh (Baked, boiled, or steamed) or further processed into a variety of desserts, snacks, and frozen and canned products. Leaves of sweet potato are commonly consumed as nutrient-dense and health promoting green leafy vegetables [5]. Sweet potato is a very important crop for subsistence farmers in the developing countries.

Despite the fact that the world production of sweet potato is steadily increasing due to improved horticultural practices, improved production technology and expansion of area under cultivation; the inadequacies of handling, storage, transportation and marketing pose a greater problem during glut season results heavy post-harvest loss (>35%) and fetches low price to the farmers [6]. Fresh sweet potato roots are large and perishable, making them vulnerable to bacteria, metabolic deterioration, physical damage, and pests. As a result, they are rarely preserved for long periods of time after harvest. This is a big impediment to making the best use of the crop and results in a lot of waste. Sweet potato roots have been advised for processing into stable forms such as chips, flour, or starch as an alternative to the challenges associated with storing and transporting raw roots in underdeveloped nations [7]. Sweet potato flour can be used to make a range of food products, including baked goods, breakfast meals, noodles or pasta-type products; sauces and brewing adjuncts [8]. Sweet potato flour can be used to enhance the natural sweetness, colour, and flavour of processed foods. In sealed containers, the flour can be kept for up to 6 months. It can also provide energy, nutrients, and minerals, as well as help meet daily nutrient requirements for -carotene, thiamin, iron, vitamin C, and protein. Sweet potato flour processing has several advantages, including storage and transportation; reducing bulkiness and losses due to the high perishability of fresh sweet potatoes; increasing shelf life and improving nutritive value because a large portion of the water content is removed, concentrating carbohydrates, proteins, fats, and minerals in the tissues of dried food products. It also provides farmers with new markets and sources of revenue, as well as the opportunity to change some of the negative perceptions about sweet potato consumption and turn them into a valuable commercial crop with a wide range of applications [9]. In product development, the final quality of a product is highly dependent on the quality of the raw ingredients used. Physical, chemical, and/or organoleptic aspects of food determine a food's functional property. As a result, if sweet potato flour is to be used in products, it must be of excellent quality. Factors that have been reported to influence the quality of sweet potato flour are variety [1], processing steps as well as processing methods such as parboiling [10], blanching [11], drying techniques [12] and peeling, pre-treatments and drying temperatures [13].

## 2. Materials and methods

The present investigation was designed to study the quality of sweet potato flour as affected by pre-treatment and drying methods. This chapter deals with the materials used for the study and the methodologies followed in determining the quality of sweet potato flour.

### 2.1 Methods

**Preparation and processing of sweet potato flour.** Three varieties of mature sweet potatoes were used in this study. Sweet potatoes were washed under tap water and peeled with a stainless-steel knife, re-washed and cut into uniform 2 mm slices. The sweet potato slices of uniform thickness and proper shape were selected for the work. The schematic representation of the work is shown in Fig.1

The pre-treatments of sample of sweet potato slices were carried out by different methods, each variety was subjected to four different pre-treatments with one control, *viz*., soaking in water for 90 minutes (TR1), blanching at 70 °C for 30 minutes (TR2), dipping in 1% of $CaCl_2$ solution for 1 minutes in room temperature (TR3), pre drying of sweet potato slices at 100 °C for 5 minutes (TR4), and, Control (TR5) (without any pre-treatment). Three methods were used to dry the four pre-treated samples and the sample without pre-treatment of sweet potato slices, *viz*., sun drying (DR1), oven drying at 70 °C (DR2) and microwave drying (DR3), respectively. These dried pre-treated sweet potato slices were grounded by electric-mixer grinder (Marlex Co.) at 9000 rpm. The grinding of sweet potato slices was carried out intermittently in the stainless-steel jar to prevent over heating of sweet potato flour. After completion of grinding operation, the sweet potato flour was sieved using 100 mesh. The flour so prepared according to the different treatments was packed in an airtight container for quality evaluation.

### 2.2 Proximate analysis

Standard methods were used to determine crude protein, crude fat, crude fiber and ash content [14] of fresh and dried sweet potato slices.

**Determination of moisture content:** Moisture content of the samples was measured by using AND MX-50 moisture analyzer (A&D Co. Ltd., Tokyo, Japan)

### 2.3 Chemical properties of flour

**Determination of starch content:** The starch content was estimated by following the method as described by [15]. To eliminate sugars, 100 mg of the material was homogenised in hot 80% ethanol. After centrifugation, the residue was kept. The residue was washed with hot 20% ethanol until anthrone reagent gave no colour in the washings. In a water bath, the residue was thoroughly dried. 5ml of water and 6.5 ml of 52% perchloric acid were added to the residue. After centrifugation, the extract was kept. Fresh perchloric acid was used to repeat the extraction. After centrifugation, the extracts were combined and the volume was increased to 100 ml using 52% perchloric acid. 0.2 ml extract, 0.8 ml distilled water, and 4 ml anthrone reagent were added to the mixture. In a boiling water bath, the reaction mixture was heated for 8 minutes and then quickly cooled. A spectrophotometer was used to measure the colour intensity at 630 nm. As a benchmark, D-glucose was employed, and the starch content was represented as a percentage. The starch content of the sample was determined by multiplying the glucose standard curve by a factor of 0.9 to arrive at the starch content. The experiment was repeated three times and the average was calculated.

**Determination of Amylose content:** The iodine colorimetric method of [16] was used to determine the amylose content of the flour. 1 ml of 95 percent ethanol and 9 ml of 1 N NaOH were used to solubilize 0.1 g of flour/starch, which was then cooked in a boiling water bath for 10 minutes. To achieve a total volume of 10 ml, 9 ml of distilled water was added to 1 ml of extract. To generate a dark blue colour, 0.5 ml of the diluted extract was pipetted into a beaker, followed by 0.1 ml I N acetic acid and 0.2 ml iodine solution (0.2 g I2+2.0 g KI in 100 ml of distilled water). The solution was vortexed, and the absorbance was measured at 620 nm using a spectrophotometer. The amylose content in the sample was estimated using the

absorbance of standard amylose with a known amylose concentration as follows:

**Calculation**

$$\text{Absorbance corresponds to 2.5 ml of test solution} = \frac{x}{2.5} \times 100 \text{ mg amylose} \quad (5)$$

**Determination of pH:** Measured with pH meter.

**Titratable acidity:** The method provided by [17] was used to calculate the titratable acidity. The flour sample was transferred to a volumetric flask using a known amount of distilled water by increasing the volume to 100 ml. After 30 minutes the supernatant was filtered using filter paper and the filtrate was used for titration. Using phenolphthalein as an indicator, an aliquot (10 ml) of the filtrate was titrated against standard sodium hydroxide. The titratable acidity was calculated using the formula below.

**Calculation**

$$\text{Acidity (\%)} = \frac{\text{Titre X Normality of alkali X equivalent wt.of citric acid X Volume made up}}{\text{Vloume of sample taken X weight of sample X 1000}} \times 100 \quad (6)$$

**Total carotenoid:** [18] was used to calculate the total carotenoid content. In a 500 ml separating funnel, material of 5 g and celite powder of 3 g were mashed in 50 ml acetone. After mashing it was filtered using a filter paper with petroleum ether (PE) of 50 ml. After rinsing the solution 3 times with distil water the lower aqueous phase was removed without removing the higher phase. In a volumetric flask of 50 ml the higher phase was collected and 15 g of anhydrous sodium sulphate was added to eliminate the remaining water. Once again after filtering the solution the volume was adjusted to PE. In a UV-VIS spectrophotometer, the absorbance was measured at 450 nm, and the total carotenoid concentration (µg) was calculated.

**Calculation**

$$\text{Total carotenoid (µg/g)} = \frac{\text{Absorbance} \times \text{Volume (ml)X } 10^4}{\text{Absorbance coefficient (2592)} \times \text{sanple weight}} \times 100 \quad (7)$$

## 3. Results and Discussion

### 3.1 Proximate composition of sweet potato flour

Moisture content of sweet potato flour from three different varieties as affected by pre-treatment and drying methods is presented in Fig 1.1. In Dergaon Red (VR1), highest moisture content (7.95 per cent) was obtained in treatment combination (TR3DR1). Similarly, for both Shree Bhadra (VR2) and ST-14 (VR3), maximum moisture content was found (TR1DR1) individually. For all the three varieties, sun drying was found to retain maximum moisture, while minimum moisture was retained in pre-dried samples with microwave drying. Statistically, the effect of varieties (V), pre-treatment (T) and drying method (D) as well as their interaction (V x T x D) on moisture content was found significant. The moisture content of sweet potato flour was found to vary from 4.55 to 9.11 per cent in the present study. Sweet potato flour was found to have a moisture content ranging from 2.50 to 13.2% [1, 19] reported 3.68 per cent moisture in sweet potato flour. The variation in moisture content of sweet potato might be due to varietal effect, stage of maturity, gaps between harvesting time and analysis, nature of pre-treatments and the method of drying employed. For long term storage of flour, 10 per cent moisture has been recommended [20].

Crude protein content of sweet potato flour is represented by Fig 1.2. The mean crude protein content in VR3 (ST-14) was found higher than the other two varieties. Amongst the treatment combinations, TR5DR2, TR3DR1 and TR5DR2 were found best in having the highest crude protein contents in Dergaon Red (5.74 per cent), Shree Bhadra (5.27 per cent) and ST-14 (5.93 per cent) respectively. Pre-dried samples in TR4 with grand mean crude protein content of 2.17 per cent were most affected and caused maximum reduction of crude protein in the flour, while controls with grand mean crude protein content of 4.33 per cent were found best. Sun dried samples were best in crude protein content irrespective of the treatments. The effect of varieties (V), pre-treatments (T) and drying methods (D) on crude protein content of sweet potato flour and their interactions (V x T x D) was found significant. Average total protein content of sweet potato is as low as 1.5 per cent (fwb) and 5 per cent (dwb), however it is superior to other roots and tubers [21, 22] reported the range of values for protein to be 0.55-5.87 per cent. In the present study, crude protein content of sweet potato flour varied from 1.18 to 5.93 per cent depending on the variety, pre-treatment and drying methods used (Table 4.2). All the pre-treatments caused significant reduction in crude protein content compared to the control (TR5) and sun drying method was found better in maximum retention of crude protein over the other two methods. Drying at higher temperature and pre-treatments of sweet potato slices might result in leaching loss of soluble protein [11, 10]. Reported that pre-treatments involving leaching such as blanching and parboiling decreased the protein contents of sweet potato flour [23]. Also. reported that crude protein content was significantly affected ($p$<0.05) by processing, variety and their interaction.

Crude fat content of sweet potato flour is illustrated in Fig. 1.3. Shree Bhadra was having the highest average crude fat content (1.86 per cent) amongst the three varieties studied. Treatments were found to lower the crude fat content in the flour as control showed the highest amount of crude fat (with grand mean of 2.07 per cent). Considering the variety, treatments and the drying methods, TR5DR1 was found best for the variety, Dergaon Red while TR5DR3 was found best for the remaining two varieties of sweet potato. Maximum reduction in crude fat content was found in TR2DR2 for Dergaon Red and TR4DR2 for both Shree Bhadra and ST-14. The statistical analysis of data revealed that the effect of varieties (V), pre-treatment (T) and drying method (D) on crude fat content of sweet potato flour and their interaction (V x T x D) was significant.

Crude fat content in sweet potato flour as influenced by variety, pre-treatment and drying method varied from 0.44 to 2.84 per. Shree Bhadra had the highest average crude fat (1.86 per cent) content followed by Dergaon Red (1.50 per

cent) [22] Reported 0.04-1.45 per cent crude fat in sweet potato flour [23]. Found that crude fat content of the three sweet potato varieties was significantly affected ($p$<0.05) by processing and variety. Variation in crude fat content might arise from varietal differences. All the pre-treatments caused significant reduction in crude fat content compared to the control (TR5) and sun drying method was found best in maximum retention of crude fat over the other two. This might be due loss of fat because of volatilization of low molecular weight fat as well as oxidation at elevated temperature. Different studies showed sun dried root and tuber crops had higher fat than other drying methods [24].

Crude fibre content of sweet potato flour for different variety, pre-treatment and drying methods are illustration in Fig. 1.4. The highest crude fibre content in all the three varieties of sweet potato was obtained in TR5DR3 i.e., control + microwave drying. Dergaon Red had 3.58 per cent and for Shree Bhadra and ST-14, the values were 1.27 and 5.41per cent respectively. ST-14 was found superior over the other two in crude fibre content. Lowest crude fibre content was observed in TR4DR1 for Dergaon Red (0.90 per cent) and TR4DR2 for Shree Bhadra (0.25 per cent) and ST-14 (2.90 per cent). Thus, pre-drying at 100 °C for 5 minutes was found to affect the crude fibre content most. Upon analysis, data on crude fibre revealed that the effect of varieties (V), pre-treatment (T) and drying method (D) on crude fibre content of sweet potato flour was significant. Interaction amongst V X T X D on crude fibre content was also found significant. The mean crude fibre content of three sweet potato varieties varied significantly and the mean value ranged from 0.80 to 4.07 per cent. All the pre-treatment resulted in significant reduction in crude fibre content compared to control (TR5) and microwave drying method retained maximum crude fibre. Crude fibre content in the sweet potato flour as affected by variety, pre-treatment, and drying methods ranged between 0.08-5.54 per cent [22]. The level of crude fibre content in the roots was reported to range from 2.5 to 5.0 per cent on dry weight basis [25]. A dietary fibre level ranges from 5.25 to 7.14 per cent was reported by [26] at different drying temperatures of the flour. Variation in crude fibre content in sweet potato might be due to varietal differences. It might also be due to the effect of some pre-treatments as [11, 10] reported that pre-treatments, the protein, crude fibre, and ash content of sweet potato flour were reduced when leaching techniques such as blanching and parboiling were used.

Ash contents in sweet potato flour is graphical illustrated in Fig. 1.5. The treatment combination, TR5DR3 was best for ash contents in sweet potato irrespective of varieties. ST-14 was found to have the highest ash content (8.04 per cent) followed by Shree Bhadra with 3.81per cent and Dergaon Red with 3.19 per cent ash when dried on microwave with no pre-treatment. Lowest ash content was obtained in TR2DR1 for all the three varieties indicating adverse effect of TR2 (blanching at 70 °C for 5 minutes) and sun drying on ash content. The effect of varieties (V), pre-treatment (T) and drying method (D) on ash content of sweet potato flour and their interaction was found statistically significant.

The ash content of the sweet potato flour is indicative of the amount of mineral elements in the flour. Ash content in sweet potato flour as influenced by variety, pre-treatment and drying method varied from 0.99 to 8.04 per cent. The three varieties differed significantly in their ash content. The mean ash content was highest in ST-14 (6.29 per cent) followed by Shree Bhadra (2.76 per cent) and the lowest mean ash content was found in Dergaon Red (1.99 per cent). The pre-treatments were found to reduce the ash content significantly compared to control and ash content was least affected by microwave drying. Ash content in sweet potato flour as affected by variety, pre-treatment, and drying methods was 0.15-2.09 per cent) [22]. The mean ash value of yellow, white and orange sweet potato varieties was found to be 3.49, 4.84 and 4.94 per cent and 3.04, 4.04 and 4.33 per cent for unpeeled and peeled roots, respectively [11]. Ash content in different organic sweet potato flour was reported to vary from 2.27 to 3.10 per cent. Such variation in ash content might be due to the varietal differences. [11, 10] reported that pre-treatments such as dipping in solution, blanching, pre-drying etc. might lead to leaching loss of minerals.

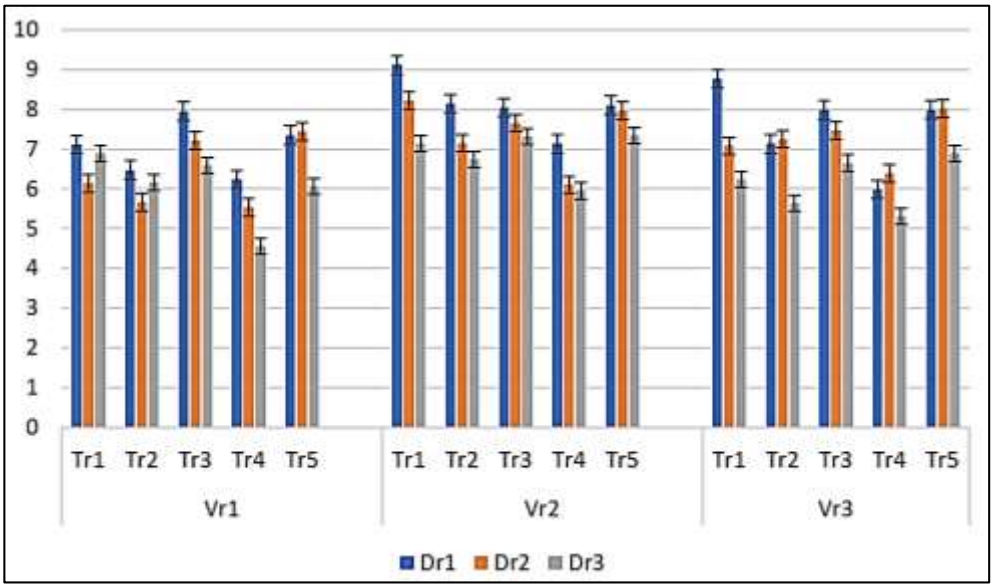


**Fig 1:** Effect of different varieties, pre-treatments and drying methods on Moisture content (%) of sweet potato flour

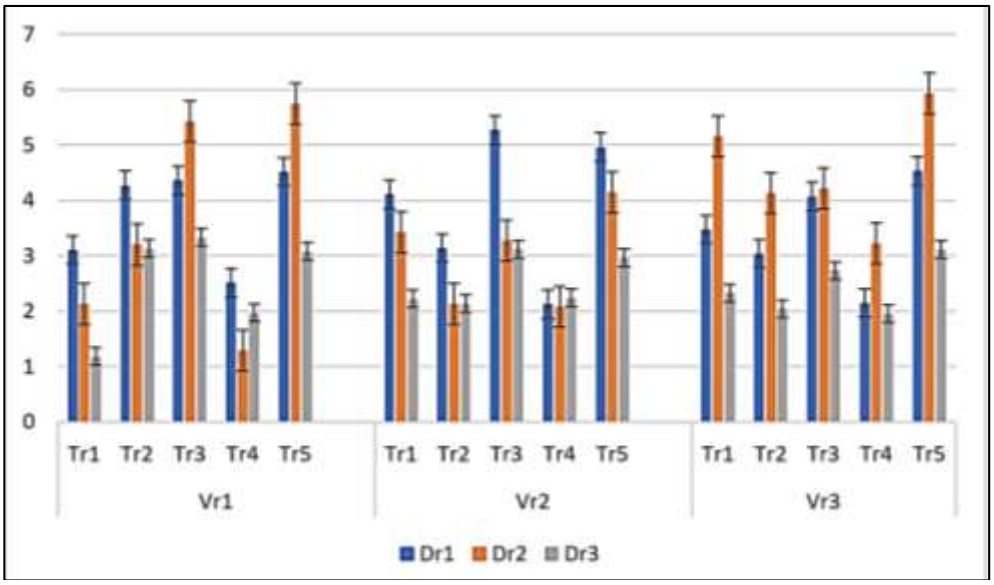


**Fig 2:** Effect of different varieties, pre-treatments and drying methods on the Protein content (g/100g) of sweet potato flour

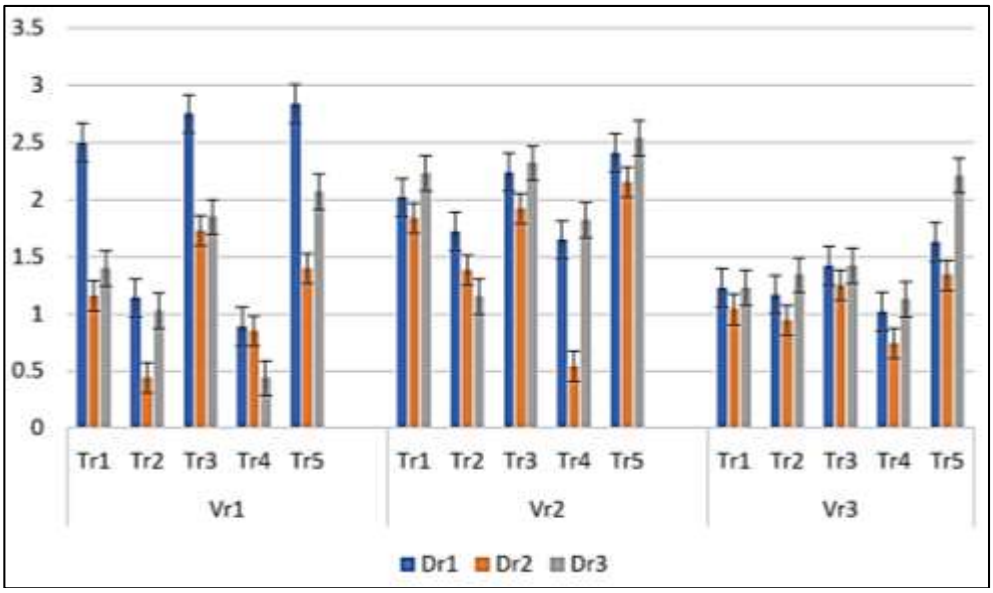


**Fig 3:** Effect of different varieties, pre-treatments and drying methods on the Fat content (%) of sweet potato flour

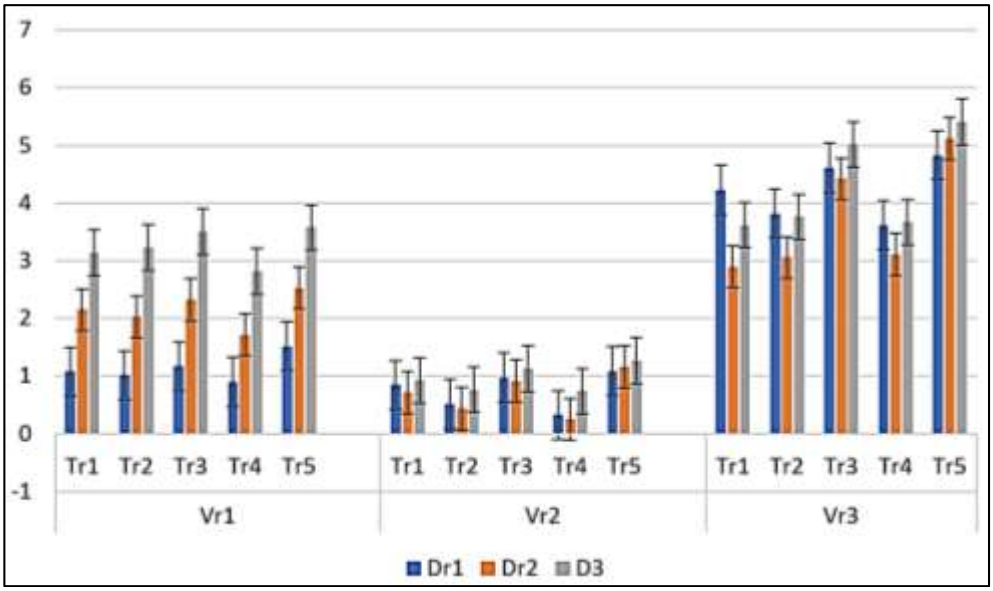


**Fig 4:** Effect of different varieties, pre-treatments and drying methods on the Fiber content (%) of sweet potato flour

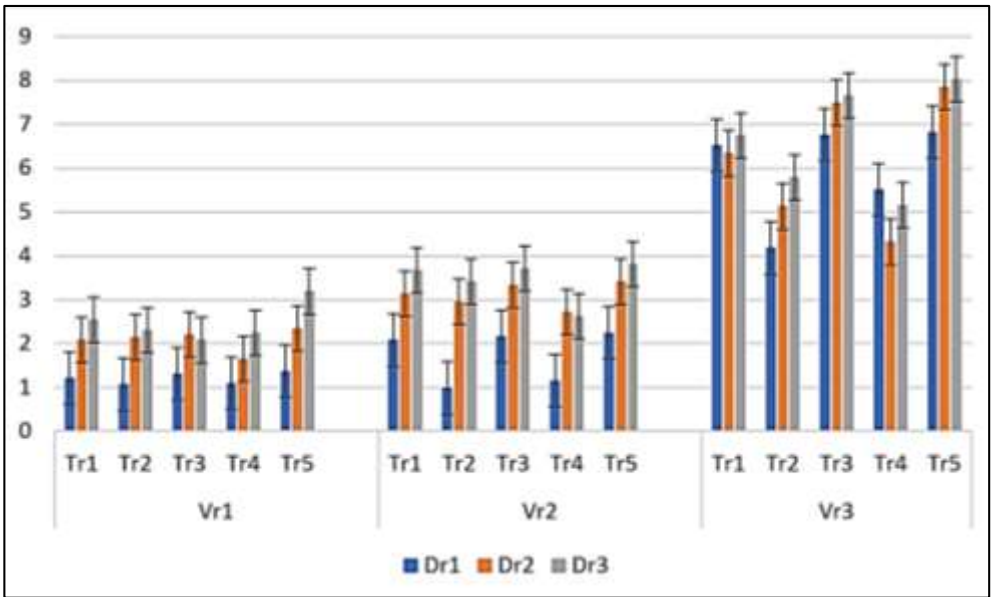


**Fig 1.5:** Effect of different varieties, pre-treatments and drying methods on the Ash content (%) of sweet potato flour

### 2.5 Chemical properties of flour

Data on starch content in sweet potato flour is graphical representation is shown in Fig. 1.6. There was a significant variation in starch contents in the sweet potato flour from the three different varieties and the treatment combinations. While TR3DR2 was found best for Dergaon Red with highest starch content of 48.00 per cent, for Shree Bhadra, it was TR5DR2 with 49.86 per cent starch and TR3DR1 for ST-14 (51.39 per cent starch). Blanching of sweet potato slices at 70 ºC for 5 minutes (TR2) followed by microwave drying (DR3) affected most the starch content in all the three varieties and the lowest starch contents were observed as 44.17, 44.72 and 46.61per cent of starch in Dergaon Red, Shree Bhadra and ST-14 respectively. The effect of varieties (V), pre-treatment (T) and drying method (D) on starch content of sweet potato flour and their interaction (V x T X D) was found significant.

Variety, pre-treatment and drying methods were found to have significant effect on the amylose content of sweet potato flour. Data on amylose content are graphical presentation in Fig. 4.7. Sweet potato flour prepared from all the varieties with no pre-treatment (TR5) and dried under sunshine (DR1) were found to have the highest amylose content. This combination (TR5DR1) resulted in 36.77, 34.81 and 38.33 per cent amylose in Dergaon Red, Shree Bhadra and ST-14 respectively, whereas the combination TR4DR3 yielded the lowest amylose contents with values 33.58, 32.18 and 35.71 per cent respectively in the same order. There was a significant effect of the varieties (V), pre-treatments (T) and drying methods (D) on amylose content of sweet potato flour. The effect of interaction of V x T x D on amylose content was also found significant.

The range of values for starch and amylose in sweet potato flour was determined to be 43.47 to 51.39 percent and 32.18 to 38.33 percent, respectively, as impacted by variety, pre-treatment, and drying process (Fig.1.6 and 1.7). The starch content of the flour was found lower to the range values of 57-85 per cent and 56-84 per cent reported by [20, 22, 27] observed that sweet potato flour of eight lines had starch content in the range of 74.50 - 80.20 per cent on dry weight basis Such variation might be due to the varietal difference and the method of estimation employed. The starch content in the flour was in the order TR4 < TR2 <TR1 <TR3 <TR5 and DR3 < DR2 <DR1 irrespective of the varieties. However [22], found that sun-dried flour had slightly lower starch content than oven-dried flour. The lower starch content of the flour from other treatments other than control (TR5) might be attributed to leaching out of the starch granules into the blanching water due to plasmolysis [28]. It is also observed that starch granules easily escaped from the cut surface into the water and get settled at the bottom [29]. Reports on amylose content of sweet potato flour in literature are limited. Values obtained in this study are found higher than those reported earlier for sweet potato starches [1] but comparable to some other reports [30]. Methods of estimation of amylose might be responsible for such variation [10]. Other factors affecting the amylose contents might be the varietal differences, processing methods, environmental factors etc. Amylose content was found highest in TR5 and lowest in TR4, which might be due to leaching loss of amylose for the pre-treatments other than the control. Sun drying was found best for maximum amylose content. Higher temperature in the other two methods might cause solubilisation of amylose and higher rate of leaching than sun drying.

The pH and Titratable acidity of sweet potato flour is presented in Fig 1.8 and Fig. 1.9. It is found that pH and Titratable acidity of sweet potato flour is affected significantly by all of the varieties, pre-treatments and the drying methods. Highest pH for Dergaon Red was 6.47 for TR5DR2. For Shree Bhadra and ST-14, highest pH was 6.38 and 6.71 respectively recorded for the treatment combination, TR5DR1. All the pre-treatments and microwave drying were found to lower the pH of the sweet potato flour. Soaking of sweet potato slices in water for 90 minutes (TR2) caused the highest reduction in pH for Shree Bhadra and ST-14. Slices dipped in 1 per cent of $CaCl_2$ solution for 1 minute in room temperature (TR4) reduced pH to the lowest in Dergaon Red. Titratable acidity was highest in treatment combination of TR4DR1 for VR1, TR2DR1 for VR2 and TR5DR3 for VR3. The values recorded were 0.67, 0.69 and 0.68 per cent respectively. The pre-treatments affected titratable acidity of the varieties differentially. The statistical analysis of data revealed that the effect of varieties (V), pre-treatment (T) and drying method (D) on pH of sweet potato flour and V x T x D

interaction on pH were significant and the effects of different drying methods on titratable acidity were found non-significant. However, V x T x D interaction on titratable acidity was significant.

The pH is a sign of acidity or alkalinity, and greatly affects the performance of flours in many food processing applications. The pH of sweet potato flours ranged from 5.29 to 6.71 (Fig. 1.8.) indicating acidic nature of flour [31]. reported pH of flour from twelve varieties of Ghanaian sweet potatoes as 5.8 to 6.2, a comparable range with the present finding. The pH range is comparable to the range suggested for sweet potato by [32, 20]. Very acidic flours (pH < 4) suggest a considerable extent of fermentation and hence starch breakdown and such acidic flours are particularly not suitable for processing into bakery and pastry products. Microwave dried samples and TR4 treated samples had the lowest pH values of all [33]. Showed that, lower pH of starch could be as a result of -COOH group formation due to the breakdown of starch molecules because of higher temperature and subsequent oxidation of glucose molecules. This might be the cause of the observed decrease in pH of flour.

The titratable acidity is an indicator of freshness in flours. The titratable acidity of sweet potato flour in this study varied from 0.43 to 0.68 per cent [31]. Reported 0.50 - 0.84 per cent titratable acidity in sweet potato flour. However, [22] found much lower acidity in sweet potato flour. Such variations might arise from varietal differences. The pre-treatments affected titratable acidity of the varieties differentially. The effects of different drying methods on titratable acidity were found non-significant. However, V x T x D interaction on titratable acidity was significant. [22] reported significant variations in values for titratable acidity due to interactions of varieties and pre-treatment. Total carotenoid content of sweet potato flour is shown in Fig. 1.10. The effect of different varieties, pre-treatments and drying method on total carotenoid content of sweet potato flour are graphically illustrated in Fig. 1.10 separately. Total carotenoid content was found highest in ST-14, the orange-fleshed variety. It was 33.76 mg/100g as against 0.95 and 3.01 mg/100 g for Dergaon Red and Shree Bhadra respectively. Drying methods and pre-treatment, both were found to influence the total carotenoid contents in sweet potato flour. Highest total carotenoid in Dergaon Red was observed in the treatment combination of TR5DR2, while for Shree Bhadra and ST-14, it was TR5DR1. Comparatively, sun drying was found better over the other two methods of drying in retaining total carotenoid contents in sweet potato flour. The statistical analysis of data revealed that the effect of varieties (V), pre-treatments (T) and drying methods (D) on total carotenoid content of sweet potato flour along with V x T x D interaction was significant. Carotenoids are a class of more than 750 naturally occurring pigments synthesized by plants, algae, and photosynthetic bacteria. These richly colored molecules are the sources of the yellow, orange, and red colors of many plants. Plant carotenoids are the primary dietary source of provitamins worldwide, with carotene as the most well-known provitamin A carotenoid. Total carotenoid content in sweet potato flours used in the study varied from 0.76 to 34.53 mg/100 g [34]. Also reported carotenoid content in the similar range.

A higher total carotenoid content was expected in orange-fleshed variety, ST-14 as the intensity of orange colour is attributed to the carotenoid content of an individual cultivar. All the pre-treatment caused significant reduction in carotenoid content compared to control (TR5) and sun drying was a better method for maximum retention [34]. Also recorded higher retention of carotenoid content in flour of orange fleshed sweet potato than yellow fleshed sweet potatoes [35]. Found decrease in carotenoid contents in samples dipped in deionized water and in blanched samples of orange-fleshed sweet potato.

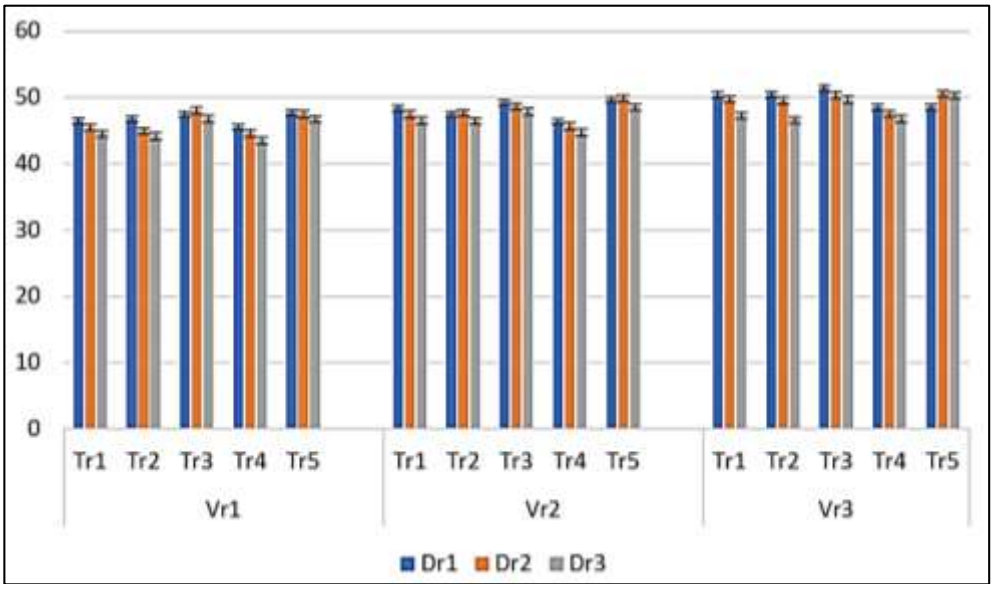


**Fig 1.6:** Effect of different varieties, pre-treatments and drying methods on the Starch content (g/100g)) of sweet potato flou

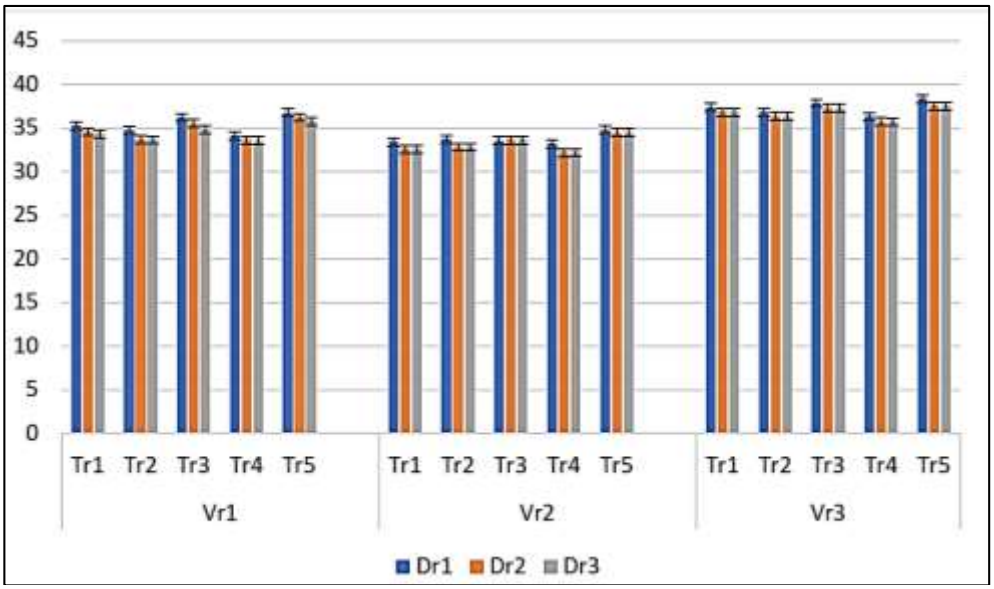


**Fig 1.7:** Effect of different varieties, pre-treatments and drying methods on the Amylose content (%) of sweet potato flour

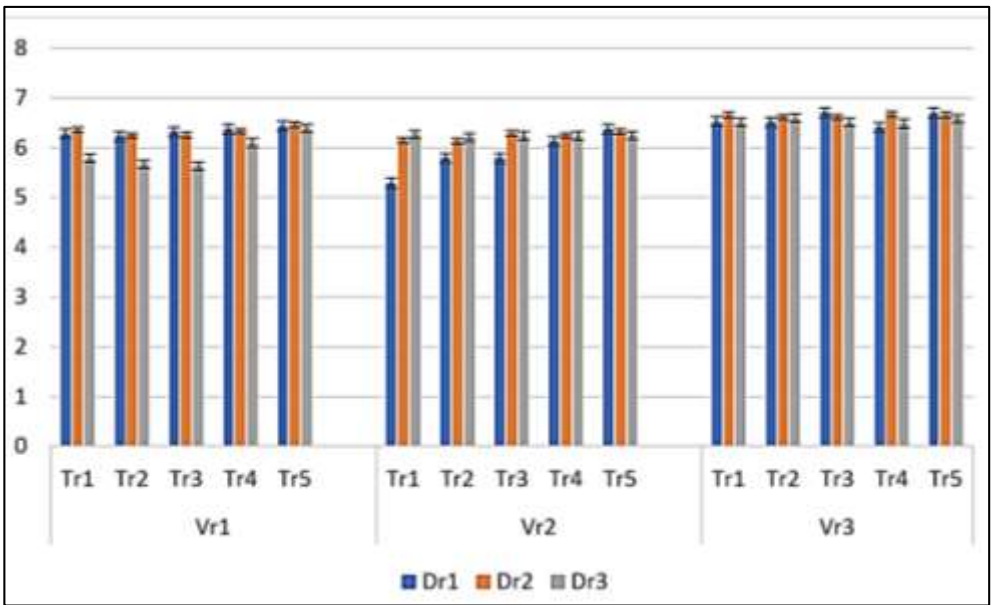


**Fig 1.8:** Effect of different varieties, pre-treatments and drying methods on the pH of sweet potato flour

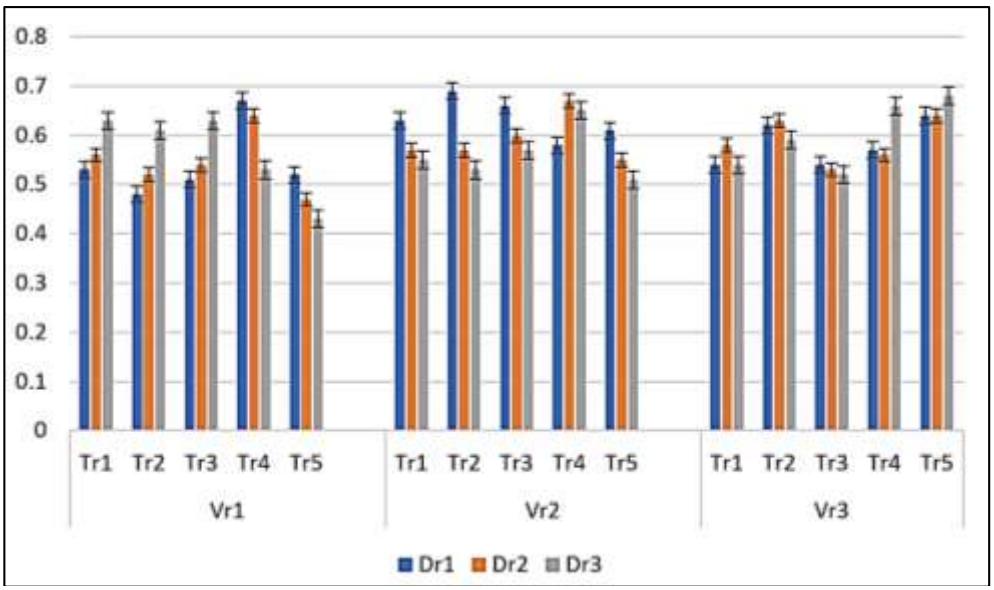


**Fig 1.9:** Effect of different varieties, pre-treatments and drying methods on the Titratable Acidity (%) of sweet potato flour

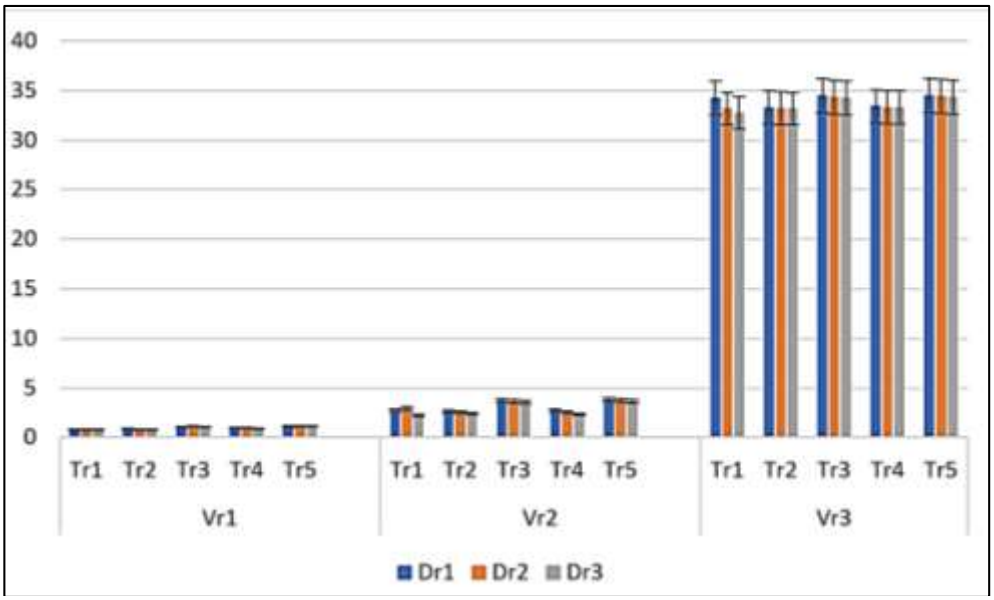


**Fig 1.10:** Effect of different varieties, pre-treatments and drying methods on the β-carotene (mg/100g) of sweet potato flour

## 4. Conclusion

Variety had a substantial impact on all of the characteristics of sweet potato flour, according to this study (SPF). Pretreatment had a considerable impact on all SPF proximates. The SPF was greatly affected by the drying procedure. All of the quality parameters of SPF were affected by the interaction of variety, pretreatment, and drying process. The chemical characteristics of sweet potato flour were notably different. Sweet potato cultivars should be targeted at specific end uses because varietal variability was a dominant contributor in the differences identified in quality attributes of the flour tested. Orange fleshed variety, ST-14 was found nutritionally superior over the other two and the quality of flour was best with treatment combinations, TR5DR1. Sun drying of sweet potato slices with no pre-treatment was found better in preparing sweet potato flour over any other combinations used in the study.

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