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ROSELLE CALYX *(HIBISCUS SABDARIFFA L.)* - CULINARY PREPERATION, SENSORY EVALUATION AND AWARENESS CREATION

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ABSTRACT

Edible flowers are innocuous and non-toxic, and because of the abundant colourful and flavourful nature, they contain many nutritional components and phytochemicals that promote health and well-being. This study focussed on the edible flower obtained from Roselle plant (*Hibiscus sabdariffa Linn.*). Next to Roselle leaves, the edible calyx part of the Roselle flower is the widely recognized part of this plant. The calyces are deeply red in colour due to the abundance of anthocyanins and flavonoids, which exhibit antioxidant activity. They also add a tangy taste, distinctive flavour, aroma and visual appeal with their natural red colour, when incorporated into recipes. Roselle calyces were consumed by our forefathers, but nowadays its use in every day cooking/incorporating into common recipes are mostly not in practice of this generation people. Therefore, this study developed 2 recipes - Roselle calyx-Ketchup & Roselle calyx drink, to suite the taste buds of young people and also created awareness, so as provoke the young minds to revive the usage of Roselle calyx and enjoy the pleasure of eating tasty and colourful foods, yet in a natural and healthy way. Sensory evaluation revealed that, the developed Roselle ketchup recipe was outstanding in appearance, flavour, taste and overall acceptability when compared with the standard recipe. Regarding the developed Roselle calyx drink, all the sensory attributes that were evaluated scored much better when compared with the standard drink, with particular reference to flavour, taste and overall acceptability of the drink receiving the maximum scores. Regarding awareness creation, the impact was determined using‘t’ test which revealed statistical significance ($p<0.05$) at 95% level on the improvement of the subjects awareness, post-test. This study successfully proved that, Roselle calyces can be used in culinary preparation that can suite the taste of young people with outstanding sensory acceptability for natural colour, better taste, health and wellness. The developed recipes may also serve as an excellent choice as a natural health promoting plant food, to have a priority over processed/unhealthy foods and also enable people to enjoy the pleasure of eating fresh, tasty and colourful, for a better and disease-free tomorrow.

Keywords:*Roselle, Hibiscus Sabdarifa L. Roselle calyces, Roselle calyx, edible flower, ketchup, refreshing drink, antioxidants, anthocyanins, flavonoids, sensory evaluation, culinary preparation, awareness on Roselle, awareness on Roselle calyx.*

INTRODUCTION

Flowers are a widely used timeless tradition, for ritual and decorative purposes. Floral centrepieces on a dinner table are a classic beauty with aesthetic appeal. However, there is much more to flowers than just beauty. The need of the hour demands that edible flowers with numerous health benefits, should regularly show up on a platter too! Culinary use of edible flowers had existed in almost all cultures, tracked from ancient Greece, Rome & Egyptian times and the first recorded mention, dated back in 140 B.C. In Europe and Asia, flower consumption has been documented to have a very long history, especially in ancient Greece and Rome, medieval France, Victorian England, Middle East as well as in China, India, Thailand, and Japan (Lim, 2014; Lu *et al*., 2016; Pinakin*et al*., 2020). But the present scenario is that, most people in the present generation have long forgotten the value of edible flowers either as a food ingredient or even as a medicinal remedy. And for people know the benefits, health value and culinary usage of edible flowers are being blurred many a times, when compared with the choice of other food items they make on a day-to-day basis.

Edible flowers are innocuous and non-toxic flowers available in various forms like vegetable flowers, fruit flowers or aromatic flowers. And because of the abundant colourful and flavourful nature, edible flowers contain many nutritional components and various phytochemicals that promote health and well-being. Phytochemicals are bioactive compounds with rich antioxidant activity, and the antioxidant activity exhibited by edible flowers are believed to depend on the concentrations of phytochemicals present in a particular flower (Mulík, S., &Ozuna, C. 2020). This study focussed on the edible flower obtained from Roselle plant (*Hibiscus sabdariffa Linn.*), an annual herbaceous shrub belonging to the family Malvaceae, widely grow in tropical countries. In addition to being known as Roselle in English-speaking regions, is also widely known with several names as Rozelle, Sorrel, Red sorrel**,** Jamanica sorrel, Indian sorrel, Guinea sorrel, etc. According to Mahadevan *et al*., 2009, in Indian languages this plant is called with different vernacular names as Lal-ambari, Patwa (Hindi), Gongura, Yerragogu (Telugu), Pulichchaikerai (Tamil), Pulachakiri, Pundibija (Kannada) and Polechi, Pulichchai (Malayalam).

Roselle is known as a food for warm climates. Next to Roselle leaves, the edible calyx part of the Roselle flower, which on the basis of growth, end use and abundant natural red colour, is the widely recognized part of the Roselle plant. A single red stemmed Roselle plant may produce up to 250 Roselle flowers which are deeply red in colour and is safe for human consumption. During last few decades, much interest is geared towards the search of natural colorants to make foods colourful and attractive, perceived for safety and health advantage over synthetic colours. And this is where Roselle calyces are of prime attraction in areas like culinary confectionary, herbal, pharmaceutical and medicinal purposes (Wu, H.Y., Yang, K.M., & Chiang, P. Y. (2018), Salami, S.O. &Afolayan, A.J. (2020). Research also reveals that, the intense red colour of Roselle calyces is due to the abundant water soluble pigment

anthocyanin, and along with flavonoids in phenolic & glycosylated forms, contribute largely for various health benefits (Nguyen, Q.V., &Chuyen, H.V. (2020). The potential advantage of consuming Roselle calyx really matters in the presence of several types of bioactive compounds with antioxidant activity that might help in managing oxidative stress induced by free oxidative radicals, a root cause for many health problems and chronic diseases (Pinakin*et al*., (2020).

Health and wellness are today's trend, especially among the awakened people of this generation who have started to advocate on the need to consume natural foods and thereby promote nutrition, health and fitness. In this context, consumption of natural food colorants instead of synthetic food colours, have become the new healthy food trend. Numerous researchers have pointed out that Roselle and its extracts possess intense red colour and functional properties (Shruthi *et al*., 2016), from where advances can be taken for developing new colourful products that may provide health benefits to many people (Singh *et al*., 2017).

Both Roselle leaves and flowers were consumed by our forefathers since thousands of years ago, but the use of Roselle calyx in every day cooking/incorporating into common recipes, are mostly not in practice of this generation people. Roselle calyx, as a food at every house hold level has long been forgotten/ignored or even underrated, in spite of great sensory attributes, health and nutritive value with attractive colour. Roselle calyces add a tangy taste, flavour, aroma, visual appeal with natural red colour to the recipes with several health advantages.

Therefore, this study was undertaken to develop modern/trendy recipes that commonly suite the taste buds of young people, so as provoke young minds to enjoy the pleasure of eating tasty and colourful foods, yet in a natural and healthy way. And to revive the consumption of our age old traditional food Roselle calyx among young people, an awareness creation on the consumption of Roselle calyces were carried out to college going students.

METHODOLOGY

Roselle (*Hibiscus sabdariffa Linn.*) flower buds, harvested during the flowering season i.e. during October to late February is plucked off the plant when the calyces are tender, plump, fleshy and crisp with deep red colour by carefully snipping with pruners/scissors or even simply by using hands and are sold in the rural farmers market in and around the places where Roselle plant is cultivated, and thus procured (Plate 1) and pre-prepared by washing in clean running water to remove the dust, dirt, impurities and also to be free from pesticides and chemicals. The buds were then pat dried using a clean cotton cloth to ensure that all the water are fully dried and the calyx portion were carefully separated and utilized for the study and the seeds were discarded (Plate 2).

Since this study aimed at developing recipes to suite to the taste of young people, two favourite recipes of this generation namely, **Roselle calyx ketchup** – *a tangy accompaniment to breakfast/crispy foods* (Ing: Red Roselle/sorrel calyces, ginger, garlic, fresh red chillies, fennel powder, roasted cumin powder, oil, warm water, sugar & black Salt.) &**Roselle calyx drink** – *a tangy, red coloured, super refreshing floral drink* (Ing: Red Roselle/sorrel calyces, ginger, lime, peppercorns, cinnamon stick, orange juice, hot water and sugar)were developed,

prepared and subjected to sensory evaluation among college going students using QDA method of assessment for attributes like appearance, flavour, colour, texture, taste and overall acceptability, along with tomato Ketchup (commercially available) and lemon juice (freshly prepared) as the standard recipes. A score card was utilized to evaluate the developed recipes using a 9 point Hedonic rating scale with the scores ranging from a maximum of 9 (like extremely) to a minimum of 1 (dislike extremely). Awareness creation on the consumption of Roselle calyces were carried out to the randomly selected college going students using audio-visual aids, and the impact was assessed through a pre and post study using a questionnaire and the results were statistically determined.

Plate 1

Roselle - Edible Flower (*Hibiscuss sabdariffa Lin*) of the study

Plate 2

Pre-preparation of Roselle for development of recipes

Roselle calyces -to develop recipes

Roselle seeds - discarded

Plate 3

Developed recipes from Roselle calyces

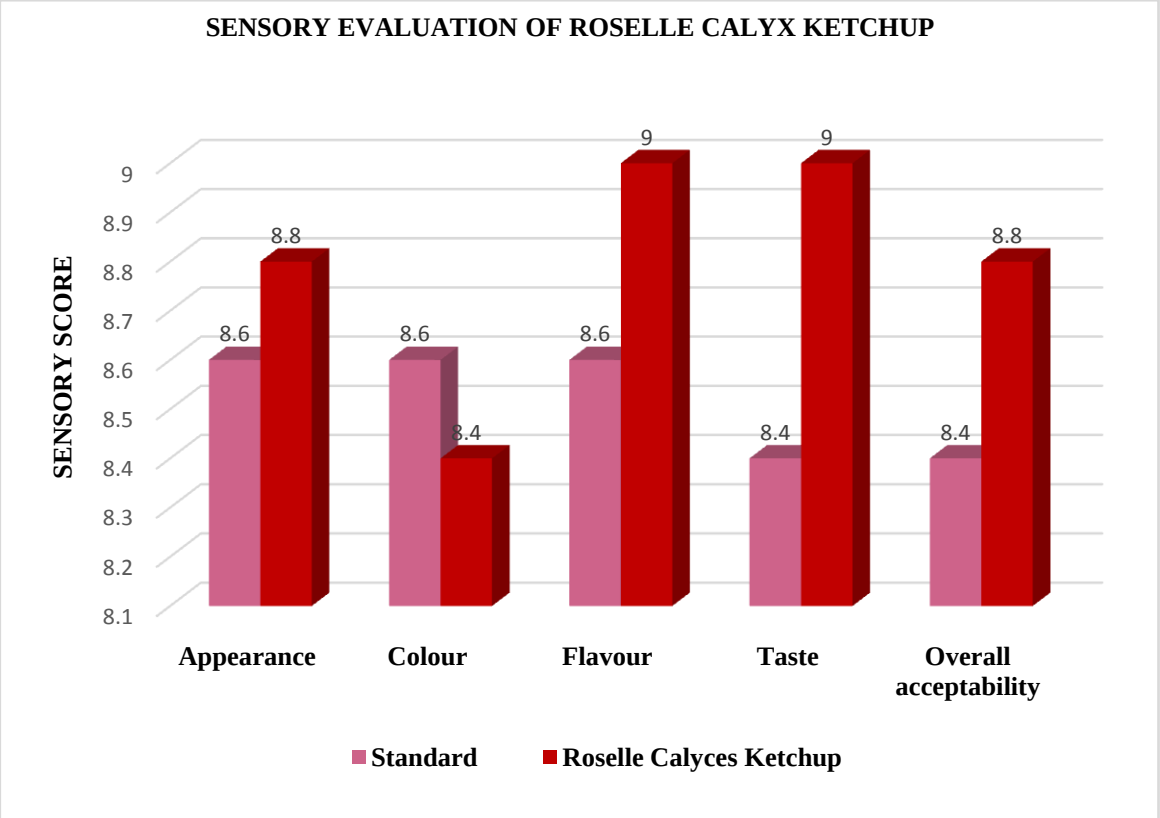
Roselle calyces - Ketchup Roselle calyces - Drink

RESULTS AND DISCUSSION

Sensory evaluation of Roselle calyx ketchup

As depicted in Figure 1, the appearance, flavour, taste and overall acceptability attributes of the developed Roselle calyx ketchup were outstanding, when compared with the standard recipe. A rich tangy taste of Roselle calyces along with the combination of all the spices added during the preparation has definitely impacted on the above stated sensory scores of the developed ketchup. Whereas, the colour of the developed Roselle calyx ketchup scored just a little less, when compared with the standard ketchup. However, the advantage of the developed Roselle calyx ketchup is that, no artificial colorants were added during preparation process, and thus the colour exhibited was the natural red colour present in the Roselle calyx, which is healthy with abundant antioxidant properties. Whereas, the standard ketchup available in the commercial market is being added with synthetic colours, which might be detrimental to health. Therefore, the developed simple, natural and home scale preparation of Roselle calyx ketchup - *a tangy accompaniment to breakfast/crispy foods*, had resulted with overall very good sensory scores when compared with the standard, thus being a better choice both in terms of sensory attributes and in health point of view.

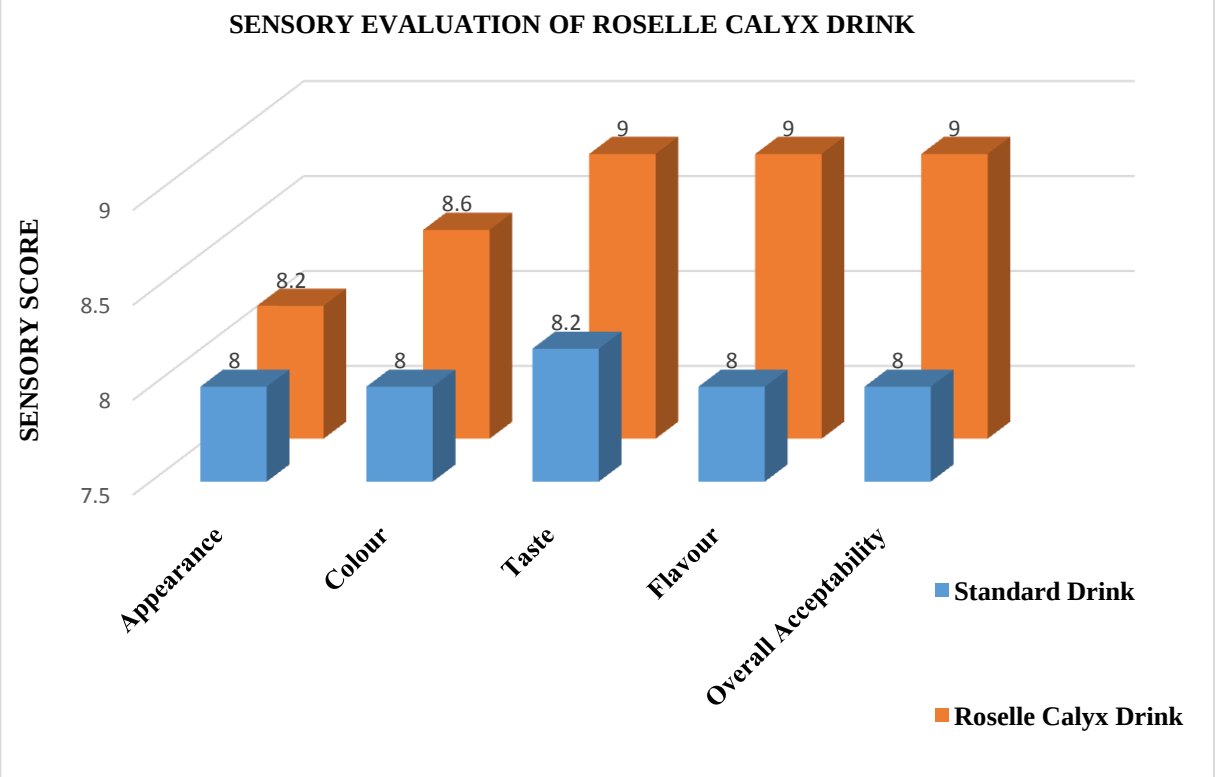
Figure 1



Sensory evaluation of Roselle calyces drink

As depicted in Figure 2, the developed Roselle calyx drink received good scores in all the sensory attributes evaluated, when compared with the standard drink. And particularly, the flavour, taste and overall acceptability scores were excellent when compared with the standard. Roselle calyces have a unique tangy taste and flavour, which when combine with the orange juice, spices and sugar, as added in the preparation of the drink resulted in *a tangy, mild red coloured, super refreshing floral drink* liked extremely by the taste panel of young subjects. Despite the increasing popularity of soft drinks and soft drink-mock tails which are major barrier for good health, they are also an important cause for many diseases and health issues. Soft drinks are not so soft because their consumption has been linked to various ailments that include dental problems, osteoporosis, diabetes, obesity and stroke. These ill effects can be kept at bay, by consuming plant based natural fruits/flowers like the developed Roselle calyx drink, unique with a tart and tangy taste and is gaining popularity globally as a refreshing drink, commonly called as sorrel drink. Thus, sensory evaluation proved that the developed Roselle calyces drink was well relished by the selected young taste panel of this study.

Figure 2



Awareness creation on the consumption of Roselle calyx

Advanced scientific knowledge in exploring innovative and health promoting foods are of paramount interest of this young generation people. Roselle calyx are excellent plant based edible substances with natural colour, rich antioxidants and nutrients with a unique blend of both tart and sweet taste. But now a days, this edible wonder flower Roselle has become the never heard/less heard of, especially by young people and thus there arises a need to create awareness on our own native edible flower Roselle calyx that has been used by our ancestors for centuries. Hence awareness was imparted to young college going students on Roselle calyces and the impact of the awareness program was statistically determined using 't' test as given in Table 1, which revealed statistical significance ($p<0.05$) at 95% level on the improvement of the subjects awareness/knowledge post-test.

Table 1
Impact of awareness creation on Roselle calyx in culinary use

S. No	Impact on awareness	Mean ± SD	t value	Level of significance
1	Before nutrition education	2.718	2.230	0.032*
2	After nutrition education	2.209		

Note: *P < 0.05,statistically significant difference between pre- and post-awareness creation.

CONCLUSION

Roselle calyx, the edible part of Roselle flower is suitable for culinary preparations because of all the desirable qualities in terms of unique taste, flavour, colour, nutritional and health promoting qualities. Most importantly, Roselle calyces are also a potential source of natural colorant to replace red synthetic colouring agents that are harmful to health. One of the main challenges that we face todays is the development of new value-added products to meet the taste, nutritional and health demands of this generation young people. This study has successfully proved that, Roselle calyces can be used in culinary preparations with outstanding sensory acceptability for better taste and wellness. And, the awareness created on Roselle calyces was successful with significant statistical post test result. The developed recipes may serve as an excellent choice as a natural health promoting plant food, to have a priority over processed/unhealthy foods and also enable people to enjoy the pleasure of eating fresh, tasty and colourful, for a better and disease-free tomorrow.

REFERENCES

Lim, T. K., & Lim, T. K. (2014). Hibiscus sabdariffa. *Edible Medicinal and Non-Medicinal Plants: Volume 8, Flowers*, 324-370.

Lu, B., Li, M., & Yin, R. (2016). Phytochemical content, health benefits, and toxicology of common edible flowers: a review (2000–2015). *Critical Reviews in Food Science and Nutrition*, *56*(sup1), S130-S148.

Mahadevan, N., & Kamboj, P. (2009). Hibiscus sabdariffa Linn.–an overview.

Mulík, S., &Ozuna, C. (2020). Mexican edible flowers: Cultural background, traditional culinary uses, and potential health benefits. *International Journal of Gastronomy and Food Science*, *21*, 100235.

Nguyen, Q. V., &Chuyen, H. V. (2020). Processing of herbal tea from roselle (Hibiscus sabdariffa L.): Effects of drying temperature and brewing conditions on total soluble solid, phenolic content, antioxidant capacity and sensory quality. *Beverages*, *6*(1), 2.

Pinakin, D. J., Kumar, V., Suri, S., Sharma, R., & Kaushal, M. (2020). Nutraceutical potential of tree flowers: A comprehensive review on biochemical profile, health benefits, and utilization. *Food Research International*, *127*, 108724.

Salami, S. O., &Afolayan, A. J. (2020). Suitability of Roselle-Hibiscus sabdariffa L. as raw material for soft drink production. *Journal of Food Quality*, *2020*.

Shruthi, V. H., Ramachandra, C. T., Nidoni, U., Hiregoudar, S., Naik, N., &Kurubar, A. R. (2016). Roselle (Hibiscus sabdariffa L.) as a source of natural colour: a review. *Plant Archives*, *16*(2), 515-522.

Singh, P., Khan, M., & Hailemariam, H. (2017). Nutritional and health importance of Hibiscus sabdariffa: a review and indication for research needs. *J. Nutr. Health Food Eng*, *6*(5), 00212.

Wu, H. Y., Yang, K. M., & Chiang, P. Y. (2018). Roselle anthocyanins: Antioxidant properties and stability to heat and pH. *Molecules*, *23*(6), 1357.