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RESEARCH ARTICLE

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Organoleptic evaluation of some home based recipes incorporating neutraceuticals single and multiple blends

SHEEL SHARMA AND KOMAL CHAUHAN

ABSTRACT

The study has been undertaken to evaluate organoleptic characteristics of the food products prepared by incorporating neutraceuticals singly and in blended forms. Three variants were prepared with incorporation of neutraceuticals at 7%, 14%, 21% along with a bland neutraceuticals free variant to serve as control. The four variants were prepared and served fresh to 15 semi-trained personals for the evaluation of organoleptic characteristics like colour, flavour, taste, texture and over all acceptability. Results revealed that the first two variants were accepted as well as control in terms of all the sensory attributes but not the third variant. Thus it can be concluded that the two neutraceuticals can be successfully incorporated up to 14% level.

Key words : Neutraceuticals, Tomatoes, Rice bran oil, Sensory evaluation

INTRODUCTION

Belief in healing powers of foods is not a new concept and has been a widely held view for generations and dating back to the time of Greek physician Hippocrates (460-377BC). There was little distinction between food and drugs till the dawn of the era of modern medicine. The practice of medicine itself consisted largely of the wise choice of natural food products. Hippocrates clearly recognized the essential relationship between food and health and emphasized that *"…..differences of diseases depend on nutriment"* (Andlauer and Furst, 2002).

The search for specific constituents of plant, animals, minerals and those of microbial origin which are beneficial to our mental and physical health has made us coin the term *'neutraceuticals'*.The term coined by *Stephen de Felice* (De Felice, 1992) combining nutrients and pharmaceuticals referred initially to food extracts that can be used as preventive drugs or dietary supplements (Prakash *et al*., 2004). They have been popularized by the foundation for the innovation in medicine by defining them as *any substances that may be considered as food or part of a food and provide medical or health benefits, including the prevention and treatment of disease* (De Felice, 1992). Thus, they are the hybrids of both nutrients and medicinal principles and fall into the grey area between foods and medicines. They are found in a number of products emerging from the food industry, the herbal and dietary supplement market and the pharmaceutical industry. They range from isolated nutrients, dietary supplements; genetically engineered "designer" foods, herbal products and processed products such as cereals and soups. They can be grouped in different ways, depending on the food sources, mode of action and chemical structures (Lee *et al.*, 2004).

Lycopene, a member of the carotenoid family is a lipid soluble antioxidant that is synthesized by many plants and microorganisms but not by humans. It is a highly unsaturated, 40 carbon acyclic molecule containing 11 conjugated and 2 unconjugated double bonds arranged in all trans configuration. It is present in many fruits and vegetables. However, tomatoes and processed tomato products (juice, sauce, soup, pizza and spaghetti sauce) constitute the major sources and account for more than 85% of all the dietary sources of lycopene. The other

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sources include water melon (23-72ug/g), pink grape fruit (33.6ug/g), guava (54ug/g) and papaya (20-53ug/g) (Rao and Agarwal, 1999). The lycopene content differs with the varieties of tomatoes and increases as the fruit ripens. It varies from 0.85mg to 13.6 mg/ 100g (Tapiero *et al.*, 2004). The lycopene levels are lower for peeled tomatoes as the removed peel is known to have higher content (Nguyen and Schwartz, 1998). The concentration of lycopene is two folds higher in pericarp than in locular cavity and that of β-carotene is four folds higher in locular cavity. Flavanoids and phenolic acids seem to be more concentrated in the skin than in flesh and Vit-E appears to be specifically located in seeds (Shi and Maguer, 2000).

Although it has been used as a food colorant for many years, it has recently received attention with respect to its antioxidant activity and potential in preventing prostrate cancer and cardio vascular diseases in humans. In turn, this has led to the idea of increasing levels of lycopene in crops, particularly in tomatoes by genetic crosses in order to increase the amounts in the diets (Bramley, 2000).

Several studies demonstrated that lycopene is absorbed more efficiently from processed tomato products compared to raw tomatoes (Stahl and Sies, 1992; Gartner *et al.*, 1997; Porrini *et al.*, 1998; Rao and Agarwal, 1998a).

Rice bran oil (RBO), a unique cooking oil is produced from the pericarp and germ of *Oryza sativa* seeds. It constitutes about 10% of rough rice grain and contains 18-22% oil. It is the only oil which besides having balanced fatty acid composition and ideal PUFA/SFA and fair linoleic acid (LA)/ alpha linoleic acid (ALNA) ratio (Ghafoorunissa, 1994); also contains three categories of natural antioxidants *i.e.* tocopherols, tocotrienols and oryzanol. High content of these antioxidants impart higher oxidative stability and longer shelf-life as compared to other edible oils (Raghuram and Rukmini, 1995).

RBO has been used as an edible oil in Japan for over two decades and is popularly known as *"Heart Oil"* in Japan. In recent years, U.S. scientists have also shown a tremendous interest in cholesterol lowering properties of RBO and this oil has acquired the status of *'Health food'* with the Americans. Since India ranks first in the annual production of crude RBO (5,00,000 tonnes) and refined RBO (>400,000 tonnes) (Gopalakrishna *et al.*, 2006) the possibility of harnessing rice bran as a source of edible oil has come into greater focus in our country in recent years and the nutritional composition, toxicological safety and hypolipidemic action of RBO have been studied with interest.

The oil is pale yellow, limpid (at 20^0C) and odourless with an acid index of <0.50, density at 20^0C between 0.920 and 0.930, refractive index at 20^0C between 1.471 and 1.475 and smoke point >200^0C and a pleasant lightly sweet flavour (Cicero and Gaddi, 2001).

The chemical composition of RBO is very close to that of groundnut oil (GNO). It has high unsaponifiable fraction (1.5-2.6%) in contrast to other refined vegetable oils that contains only 0.3-0.9% (Rong *et al.*, 1997). It contains oleic acid (38.4%) as 2-oleate, linoleic acid (34.4%) and α-linolenic acid (2.2%) as unsaturated fatty acid and palmitic (21.5%) and stearic acid (2.9%) as saturated fatty acid (Edwards and Radcliffe, 1994; Radcliffe *et al.*, 1997).

In contrast to other common refined vegetable oils, crude RBO contains an unusually high content of unsaponifiables (up to 5%) mainly composed of sterols (43%), 4- methyl sterols (10%), triterpene alcohols (28%) and less polar components (19%) (Sayre and Saunders, 1990). Phytosterols include β- sitosterol (900mg%), campesterols (500mg%), stigmasterol (250mg%), squalene (320mg%) and γ- oryzanol (1.6%). γ- oryzanol is a mixture of ferulic acid esters of triterpene alcohols such as cycloartanol (106 mg/dl), cycloartenol (482 mg/dl) and 24-methylene cycloartanol (494 mg/dl) (Metwally *et al.*, 1974; Norton, 1995). It also contains small variable quantity of tocotrienols (72-612 ppm especially â and g tocotrienols) (Rukmani and Raghuram, 1991). Moreover it is naturally rich in á-tocopherol (100mg%).

However, the levels of neutraceutical lipid components tocols (tocopherols and tocotrienols), phytosterol, γ- oryzanol, octasonal and squalene, as well as total lipids in rice decreased markedly with milling (Ha *et al.*, 2006).

MATERIALS AND METHODS

Collection of materials:

Red and ripe tomatoes were procured from the local market of Banasthali during natural winter season of tomatoes. Other materials like water melon, macroni, refined wheat four, wheat flour, semolina, besan were procured from local supermarket after quality assurance of each ingredient. Rice bran oil was obtained gratis from A.P.Solvex Ltd. Dhuri, India.

Product development:

The products developed, were prepared keeping in mind that, they are commonly consumed by most of the people and were easy to prepare and accepted by consumers of all the age groups. The products developed by incorporating tomatoes as a source of lycopene with watermelon juice christened as delight; sweet and sour chutney. The corresponding control recipes were prepared without enrichment with tomatoes. The three variants were

prepared by further enrichment with tomatoes at 7%, 14% and 21% levels.

Products developed by incorporating rice bran oil (RBO) were *gujia* and *shorba*. The corresponding control recipes were prepared in groundnut oil and the three variants were prepared by incorporating RBO at 7%, 14% and 21% levels to groundnut oil.

Further, two products *viz.* 'Dhokla' and 'tomato poori' were developed using a blend of tomatoes and rice bran oil.

Sensory evaluation:

Sensory evaluation has been defined as a method used to evoke, assess, analyze and interpret responses to products that are perceived through the senses of sight, smell, touch, taste and hearing (Stone and Sidel, 1993). It is a natural criterion for acceptance or rejection of food. Sensory quality characteristics were evaluated by an experienced panel of 15 semi-trained panelists using 5 point hedonic scale for colour, appearance, texture, taste, after taste and over all acceptability (Ranganna, 1979).

Statistical analysis:

The results of sensory quality were statistically analyzed using analysis of variance (ANOVA) and the variation was discerned on the basis of p value. If there was a significant difference between control and the three variants in one or more attributes, results were further statistically analyzed using students- t- test. In addition, over all acceptability of the products and their three variants were further judged by coefficient of variation (CV).

RESULTS AND DISCUSSION

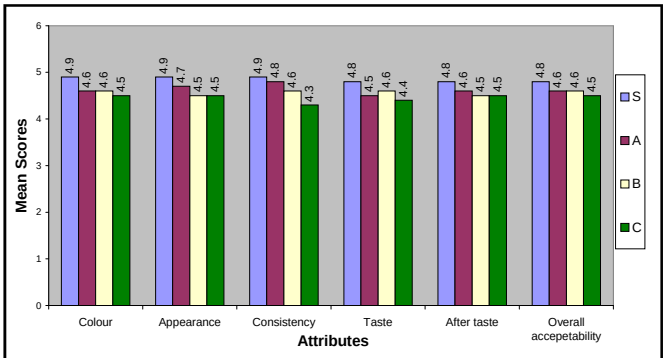
The results obtained from the present investigation as well as well as relevant discussion have been presented under following heads :

Organoleptic evaluation of food products incorporating different levels of tomato:

Delight-watermelon drink:

The mean scores for colour of watermelon juice christened as 'delight' varied from (4.5±0.12) to (4.9±0.04) in control and the three variants (A-variant-I; B-variant-II; C-variant-III) prepared by incorporating tomatoes at 7%, 14% and 21% levels as shown in the Fig. 1. The first and second variants with 7% and 14% levels of tomatoes incorporated, obtained the same score (4.6±0.09). However, the third variant with 21% level of incorporation showed less score (4.5±0.12).

The mean scores obtained for appearance varied from (4.5±0.05) to (4.9±0.04). Sensory mean scores for



S: Control Delight-Watermelon juice- without enrichment with tomatoes

A, B, C: Variant I, II and III- Further enriched with 7%; 14% and 21% tomatoes, respectively

[a]p =0.05 Significantly different from standard

[b]p=0.05 Significantly different from A (Variant I)

[d]p =0.05 Significantly different from B (Variant II)

NS: Non-significant

Fig. 1 : Organoleptic evaluation scores for the acceptability of *'Delight-Watermelon Juice'* incorporating different levels of tomatoes

appearance of delight prepared with 14% and 21% level of variation were same (4.5±0.05) and (4.5±0.10), respectively.

The data reveal that the mean scores obtained for consistency were between (4.3±0.09) to (4.9±0.04). The mean score secured by the third variant with 21% level of incorporation was minimum (4.3±0.09).

The mean scores, secured for taste of delight were ranging from (4.4±0.09) to (4.8±0.05) with the minimum score recorded for the third variant with 21% level of incorporation (4.4±0.09).

The mean scores for after taste varied from (4.5±0.09) to (4.8±0.05). The second and third variants with 14% and 21% level of incorporation secured (4.5±0.09) and (4.5±0.12).

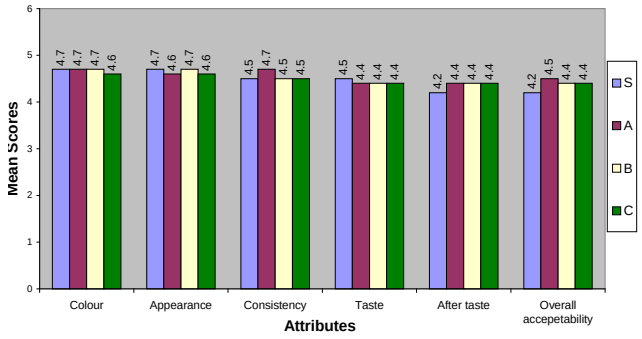
The mean scores registered for overall acceptability varied from (4.5±0.11) to (4.8±0.06). The mean scores of second and third variants were 4.6±0.09 and 4.6±0.07. However, the third variant with 21% level of incorporation secured less (4.5±0.11).

Statistical analysis of organoleptic evaluation scores revealed that the control and the three variants (I, II and III) differed significantly in terms of appearance, consistency and taste ($p<0.05$). On further probing it was found that the second and third variants with 14% and 21% level of incorporation of tomatoes showed a significant difference in appearance as compared to that of control. Likewise, a significant difference was observed in consistency in third variant as compared to control and

to the first variant. Similarly, in terms of taste, the first and third variant showed a significant difference as compared to control as evident from Fig. 1. Thus, it can be concluded that the third variant with 21% level of incorporation was less accepted as compared to control and other two variants in appearance, consistency and taste.

Sweet and sour chutney:

The mean scores for colour of sweet and sour chutney varied from (4.6±0.12) to (4.7±0.09) in control and the three variants (A-variant-I; B-variant-II; C-variant-III) prepared by incorporating tomatoes at 7%, 14% and 21% levels as shown in the Fig. 2. The first and second variants with 7% and 14% levels of tomatoes incorporated, recorded the same score (4.7±0.09) as the control while the third variant with 21% level of incorporation showed a lower rating (4.6±0.12).



S- Control sweet and sour chutney- without enrichment with tomatoes
A, B, C: Variant I, II and III- Further enriched with 7%; 14% and 21% tomatoes, respectively
NS: Non-significant

Fig. 2 : Organoleptic evaluation scores for the acceptability of 'Sweet and Sour Chutney' incorporating different levels of tomatoes

The mean scores obtained for appearance varied from (4.6±0.09) to (4.7±0.09). Sensory mean scores for appearance of sweet and sour chutney prepared with 7% and 21% level of variation were (4.6±0.09) and (4.6±0.10). However, the second variant with 14% level of incorporation (4.7±0.09) scored similar to control (4.7±0.06).

The data indicate that the mean scores obtained for consistency were between (4.5±0.09) to (4.7±0.09). The mean scores of second (4.5±0.10) and third (4.5±0.09) variants were similar with that of control (4.5±0.09).

The mean scores, secured for taste of sweet and sour chutney were ranging from (4.4±0.11) to (4.5±0.09). All the three variants secured the same score (4.4±0.11), but recorded a lower rating as compared to control (4.5±0.09).

The mean scores for after taste varied from (4.2±0.09) to (4.4±0.12). The first and third variants with 7% and 14% secured the same score (4.4±0.12) and was similar to the third variant (4.4±0.09) but recorded a higher rating as compared to control (4.2±0.09).

The mean scores registered for overall acceptability varied from (4.2±0.08) to (4.5±0.12). The mean scores of second and third variant were 4.4±0.11 and 4.4±0.13, respectively. However, the first variant with 7% level of incorporation secured more (4.5±0.12).

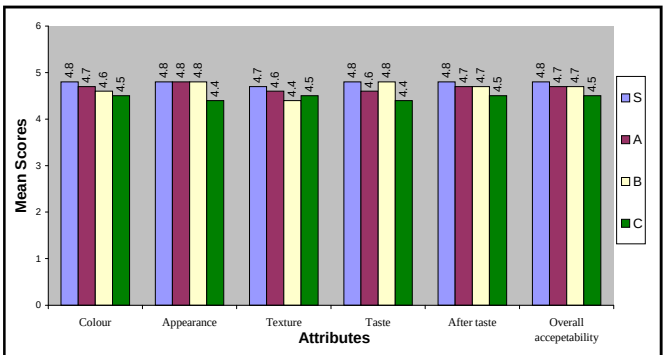
Sensory analysis revealed that all the variations (I, II and III) were equally accepted as control and did not register any significant change in terms of various attributes ($p>0.05$).

Organoleptic evaluation of food products incorporating different levels of rice bran oil:

Gujia:

The mean scores for the colour attribute of *gujia* varied from (4.5±0.12) to (4.8±0.09) in control and the three variants (A-variant-I; B-variant-II; C-variant-III) prepared by incorporating RBO at 7%, 14% and 21% levels as shown in the Fig. 3. The first variant with 7% level of incorporation secured the maximum score (4.5±0.12).

The mean scores obtained for appearance varied from 4.4±0.10 to 4.8±0.06. Sensory mean scores for appearance



S- Control *Gujia*- prepared in groundnut oil (GNO)
A, B, C: Variant I, II and III- Cooking medium GNO substituted with RBO at 7%; 14% and 21%
[a]p ≤0.05 Significantly different from standard
[b]p≤0.05 Significantly different from A (Variant I)
[c]p≤0.05 Significantly different from B (Variant II)
[c]p≤0.05 Significantly different from C (Variant III)
NS-Non-significant

Fig. 3 : Organoleptic evaluation scores for the acceptability of *'Gujia'* incorporating different levels of rice bran oil

of *gujia* prepared with 7% (4.8±0.05) and 14% (4.8±0.05) level of variation were similar to control (4.8±0.06).

The data indicate that the mean scores obtained for texture were between 4.4±0.11 to 4.7±0.09. The first variant with 7% level of incorporation secured the maximum score (4.4±0.11).

The mean scores, secured for taste of *gujia* were ranging from 4.4±0.11 to 4.8±0.09. The mean scores of second variation (4.8±0.09) were similar to that of control (4.8±0.08).

The mean scores obtained for after taste varied from 4.5±0.12 to 4.8±0.09. The mean scores of first (4.7±0.09) and second (4.7±0.07) variants with 7% and 14% levels of incorporation were similar.

The mean scores registered for overall acceptability varied from 4.5±0.12 to 4.8±0.09. The mean scores of first and second variants were 4.7±0.07 and 4.7±0.09 respectively.

Sensory analysis revealed that there was a significant difference in appearance in control and all the three variants (I, II and III). The result was further interpreted which revealed that the third variant with 21% level of incorporation showed significant difference from control as well as with other two variants ($p<0.05$). However, all the variants were equally accepted as control and did not register any significant change in other attributes ($p>0.05$) pointing towards their acceptability as an improvised form of *gujia*.

Shorba:

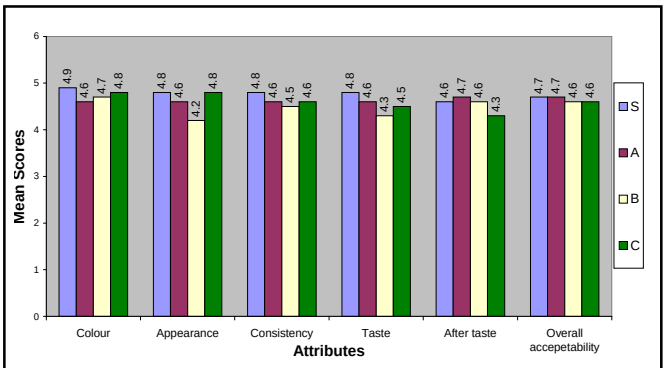
The mean scores for the colour attribute of *shorba* varied from 4.6±0.09 to 4.9±0.06 in control and the three variants (A-variant-I, B-variant-II; C-variant-III) prepared by incorporating RBO at 7%, 14% and 21% levels as shown in the Fig. 4. The third variant with 21% level of incorporation scored the maximum (4.8±0.09).

The mean scores obtained for appearance varied from 4.2±0.09 to 4.8±0.09. Sensory mean scores for appearance of *shorba* prepared with 21% level of incorporation was the highest (4.8±0.09) and was similar to control (4.8±0.06).

The data indicate that the mean scores obtained for consistency were between 4.5±0.11 to 4.8±0.06. The first and third variants with 7% and 21% level of incorporation obtained the same score (4.6±0.09).

The mean scores for taste of *shorba* were ranging from 4.3±0.10 to 4.8±0.09. The mean scores of first variant were highest (4.6±0.09) as compared to the other two variants (Fig. 4).

The mean scores secured for after taste varied from 4.3±0.10 to 4.7±0.09. The mean scores of the first variant



S- Control *Shorba*- prepared in groundnut oil
A, B, C: Variant I, II and III- Cooking medium GNO substituted with RBO at 7%; 14% and 21%
NS: Non-significant

Fig. 4 : Organoleptic evaluation scores for the acceptability of *'Shorba'* incorporating different levels of rice bran oil

with 7% level of incorporation was maximum (4.7±0.09) and higher than the control (4.6±0.09). However, the second (4.6±0.11) variant scored equally good as control (4.6±0.09). However, the third variant with 21% level of incorporation obtained a lower rating (4.3±0.10).

The mean scores registered for overall acceptability of *shorba* of the first variant was same as control (4.7±0.09). The other two variants at 14% and 21% level of incorporation secured the same score (4.6±0.12) but had a lower rating as compared to control (4.7±0.09).

Sensory analysis revealed that all the variations (I; II and III) were equally accepted as control and did not register any significant change in terms of various attributes ($p>0.05$).

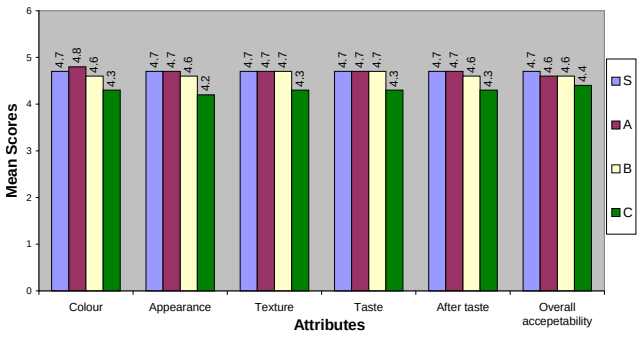
Organoleptic evaluation of food products incorporating varied blends of tomato and rice bran oil:

The various products developed by incorporating varied blends of tomato and rice bran oil were tomato soup; *Dhokla* and 'tomato poori'.

Dhokla:

The mean scores for the colour attribute of *Dhokla* varied from 4.3±0.10 to 4.8±0.05 in control and the three variants (A-variant-I; B-variant-II; C-variant-III) prepared by incorporating varied blends of tomato and rice bran oil at 7%, 14% and 21% levels as shown in the Fig. 5. The first variant with 7% level of incorporation, recorded a highest score (4.8±0.05) as compared to control and the other two variants.

The mean scores obtained for appearance varied from



S- Control *Dhokla*- enriched with blends of tomato and groundnut oil
A, B, C: Variant I, II and III- enriched at 7%; 14% and 21% with blends of tomato and RBO
NS: Non-significant

Fig. 5: Organoleptic evaluation scores for the acceptability of *'Dhokla'* incorporating varied blends of tomato and rice bran oil

4.2±0.11 to 4.7±0.07. Sensory mean scores for appearance of *Dhokla* prepared with 7% level of variation were same as that of control (4.7±0.07).

The data indicate that the mean scores obtained for texture were between 4.3±0.14 to 4.7±0.07. The mean scores of first and second variants with 7% and 14% level of incorporation were same as that of control (4.7±0.07). However, the third variant recorded a lower rating (4.3±0.14) as compared to control.

The mean scores, secured for taste of *Dhokla* were ranging from 4.3±0.10 to 4.7±0.07. The first and second variants with 7% and 14% level of incorporation showed similar score as control (4.7±0.07). However, the third variant with 21% level of incorporation secured the minimum score (4.3±0.10).

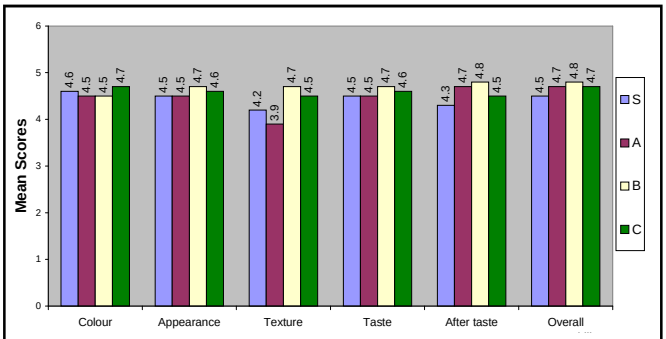
The mean scores for after taste varied from 4.3±0.14 to 4.7±0.07. The first variant with 7% level of incorporation recorded the same score as control (4.7±0.07). However, second and third variants with 14% and 21% level of incorporation recorded a lower rating.

The mean scores registered for overall acceptability varied from 4.4±0.12 to 4.7±0.07. The first and second variants with 7% and 14% obtained a similar score (4.6±0.07). The third variant with 21% level of incorporation recorded the minimum score (4.4±0.12).

Sensory analysis revealed that all the variations (I; II and III) were equally accepted as control and did not register any significant change in terms of various attributes ($p>0.05$).

Tomato Poori:

The mean scores for the colour attribute of 'tomato poori' varied from 4.5±0.11 to 4.7±0.10 in control and the three variants (A-variant-I; B-variant-II; C-variant-III) prepared by incorporating varied blends of tomato and rice bran oil at 7%, 14% and 21% levels as shown in Fig. 6. The first and second variants with 7% and 14% level of incorporation, recorded a similar score (4.5±0.11). The third variant, however, secured the maximum score (4.7±0.10).



S- Control *Tomato poori*- enriched with blends of tomato and groundnut oil
A, B, C: Variant I, II and III- enriched at 7%; 14% and 21% with blends of tomato and RBO
[a]p ≤0.05 Significantly different from standard
[c]p ≤0.05 Significantly different from B (Variant II)
[d]p ≤0.05 Significantly different from C (Variant III)
NS: Non-significant

Fig. 6 : Organoleptic evaluation scores for the acceptability of *'Tomato Poori'* incorporating varied blends of tomato and rice bran oil

The mean scores obtained for appearance varied from 4.5±0.10 to 4.7±0.07. Sensory mean scores for appearance of tomato poori prepared with 7% level of variation (4.5±0.10) were similar to that of control (4.5±0.11). However, the second variant with 14% level of incorporation obtained the maximum score (4.7±0.07).

The data indicate that the mean scores obtained for texture were between 3.9±0.11 to 4.7±0.11. The mean scores of second variant obtained were highest (4.7±0.07). However, the first variant recorded a lower rating (3.9±0.11).

The mean scores, secured for taste of 'tomato poori' were ranging from 4.5±0.10 to 4.7±0.07. The second variant with 14% level of incorporation showed highest score (4.7±0.07). However, the first variant with 7% level of incorporation recorded same score as control (4.5±0.10).

The mean scores for after taste varied from 4.3±0.06 to 4.8±0.06. The second variant with 14% level of incorporation secured maximum (4.8±0.06) score (Fig. 6).

The mean scores registered for overall acceptability

varied from 4.5±0.10 to 4.8±0.06. The first and third variants with 7% and 21% level of incorporation recorded the same score (4.7±0.09). However, the second variant with 14% level of incorporation secured the highest (4.8±0.06).

Sensory analysis revealed that there was a significant difference in after taste in control and in all the three variants (I; II and III). The result was further interpreted which revealed that the first and second variants with7% and 14% level of incorporation showed significant difference from control ($p<0.05$). Moreover, the second variant also differed significantly from third variant ($p<0.05$). However, all the variants were equally accepted as control and did not register any significant change in other attributes ($p>0.05$), pointing towards their acceptability as an improvised form of 'tomato poori'.

Results of the present study revealed that, most of the recipes prepared by incorporating neutraceuticals either singly or in blended form were more or less acceptable with few exceptions *viz.,* water melon juice (delight), *gujia* and 'tomato poori'. The variants (7%; 14% and 21%) of these products showed a significant difference in a one or more than one sensory attributes indicating that they are less acceptable as compared to control. It was found that the third variant (21%) of watermelon juice showed a gradual decrease in scores of sensory attributes of appearance, consistency and taste indicating that tomatoes can be added successfully up to 14% level. Calvo *et al*., (2008) performed experiments to develop dry fermented sausages containing 0%, 0.6%, 0.9% and 1.2% (w/w) of dry tomato peel. The sensory and textural properties and overall acceptability of all sausages were found to be good, indicating that tomato peel could be added to dry fermented sausages to produce a meat product enriched in lycopene. Similarly, Garcia *et al.* (2009) reported that addition of dry tomato peel (DTP) at 4.5% resulted in good overall acceptability and a lycopene content of 4.9 mg/100 g of cooked hamburger.

Products developed by incorporating rice bran oil (RBO) were well accepted however, sensory analysis revealed that the third variant (21%) of *gujia* was less accepted in appearance attribute as compared to the control and other two variants. Valsalan *et al.* (2004) reported that the products prepared in RBO were as well or more accepted obtaining equal or higher mean scores on organoleptic evaluation as compared to the ones prepared in groundnut oil. Garcia *et al.* (2009b) studied the optimum formulation for mayonnaise-type spreads containing rice bran oil (RBO) and soy protein concentrate (SPC) based on sensory acceptability and found that flavored spreads (sour cream and onion, cheddar and sour cream, or Monterrey jack dried cheese)were significantly more acceptable than the plain formulation (37% RBO, 6% SPC, and 57% water,). Moreover, the purchase intent of all flavored products also significantly increased when consumers had been given the information about potential health benefits associated with RBO and SPC in the spreads.

A study showed that soft served ice-cream prepared by replacing milk fat with RBO (5%-35%) was well accepted at all the levels of incorporation except for the flavour at 35% (Sharma *et al*., 2006). Another study demonstrated that by increasing the percentage of RBO in baked products-cookies, the TBA number decreases and the onset of rancidity is delayed, thus, extending the shelf life of the product (Sharif *et al*., 2003).

Conclusion:

The study revealed that first two variants (7% and 14% of each recipe) have been found more acceptable as compared to the third variant (21%) containing higher proportion of neutraceuticals

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Address for correspondence :
KOMAL CHAUHAN
Department of Food Science and Nutrition,
Banasthali University, Faculty of Home Science,
Banasthali Vidyapeeth, BANASTHALI (RAJASTHAN), INDIA
E. mail : shivam_kim@yahoo.com

Authors' affiliations :
SHEEL SHARMA
Department of Food Science and Nutrition,
Banasthali University, Faculty of Home Science,
Banasthali Vidyapeeth, BANASTHALI (RAJASTHAN), INDIA
E. mail. : sheelsh56@yahoo.com