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The comparative analysis of proximate and nutritional composition of different mixture of quinoa and Ragi flour

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Abstract
The prepared study was done on the Quinoa and Ragi Mixture powder at A=80% Q + 20% R, B= 50% Q + 50% R and C= 20% Q + 80% R. as these two were well known for their antioxidant property as edible flour. We have prepared the 3 standard mixtures and analyse the bio-compounds present within these for their most deserving nutritional values. And found that the 50% mixture of both were found to be having highest Proximate and Nutritional composition.

Keywords: Nutritional analysis, quinoa, ragi flour

Introduction
These days increasing obesity and aging problems becomes the most serious health troubles as this which generates the high oxidative free radicals which in returns fastens the aging in humans. There were many herbal extracts were using as anti aging supplements and reduce excess fat but out of which the most in trend was Quinoa and Ragi. Both were used as anti aging supplements and prepared many health drink and cookies as for its best results in their daily dietary contents. Quinoa is a super grain that has evolved through centuries is packed with all the essential nutrients that provide complete nutrition. Quinoa is a gluten-free seed enriched with the goodness of protein, providing us all the essential amino acids besides being a good source of dietary fibre. Ragi flour is finger millet powder. Ragi is an ideal source of plant protein, is rich in calcium and has high iron and other mineral content. It is low in fats. Ragi is a rich source of fibre and can be made a part of the everyday diet in the form of porridge, rotis, dosa, puttu, and various other dishes. A good vegan gluten-free source of protein, Ragi is also a good baby food due to its rich nutrient content.

Experimental setup: We had taken the freshly grounded flour of each quinoa and ragi and sieved them properly now for our experiments we had taken 3 proportion of the mixture of Quinoa and Ragi flour in different proportion of each flour.
A=80% Quinoa + 20% Ragi,
B= 50% Quinoa + 50% Ragi and
C= 20% Quinoa + 80% Ragi.
Now each proportion were taken to lab for By using the above procedure the values of Moisture, Carbohydrate, Crude fat, Crude protein, Ash, Crude fibre were calculated as Proximate composition of mixture sample of quinoa and Ragi flour while Nutritional composition of mixture sample of quinoa and Ragi flour were recorded in Dietary fiber, β-Carotene and Vitamin C.

Moisture content: Moisture content of samples was determined by drying the sample at 105°C until a constant weight was observed. 2g of sample was taken in a previously weighed crucible (Wc). The crucible containing the sample (Wcs) was then subjected to drying in oven at 105°C. At an interval of every 4 hours, the sample was taken out of the oven with the help of a pair of tongs. It was then immediately put in a dessicator to avoid moisture (present in air) absorption by the sample and was allowed to cool.

The crucible containing the sample after oven drying was reweighed (Wcsd). The readings were noted and the process was repeated until a constant weight of crucible containing the sample was obtained. Moisture content in 100g of sample was calculated using following formula

$$\text{Moisture content} = \frac{(Wcs - Wc) - (Wcsd - Wc)}{(Wcs - Wc)} \text{ X } 100$$

Where: Wc: Weight of emplty crucible, Wcs: Weight of crucible + sample prior to drying, Wcsd: Weight of crucible + sample after drying

Crude ash: Crude ash content of samples was determined by placing 2 g of sample in muffle furnace at 550°C for 6 hours. Ash content in 100 g of sample was calculated using following formula

$$\text{Crude ash content} = \frac{(Wca - Wc)}{(Wcs - Wc)} \text{ X } 100$$

Where, Wca: Weight of crucible with ash, Wc: weight of empty crucible, Wcs: weight of crucible with sample.

Crude protein: Kjeldahl method was employed to determine the crude protein content of samples. The analysis involves 3 processes *viz*. digestion, distillation, and titration. 5g of sample was digested in 10 ml sulphuric acid for about 3 hours to obtain a clear solution. Kjeldahl distillation unit was set up and clear liquid obtained was distilled by adding 40% concentrated sodium hydroxide solution in 50 ml water. The process results in liberation of ammonia which was then collected over 25 ml boric acid solution containing indicator (bromo cresol green and methyl red). It was then titrated against 0.05N sodium hydroxide solution. Blank was prepared similarly without using the sample. Quantification of crude protein content was done by converting nitrogen to protein using conversion factor of 6.25. Crude protein content in 100g of sample was calculated using following formula

$$\text{Crude protein content} = \frac{Vs - Vb}{Ws} \text{ X } 14 \text{ X } 6.25 \text{ X } 100$$

Where, Vs: Titration volume of sample, Vb: Titration volume of blank, 14: Molecular weight of nitrogen, 6.25: Nitrogen to protein conversion factor

Crude fat: Soxhlet method was employed for determination of crude fat content of samples. About 2g of moisture free sample put in a thimble. Petroleum ether (50ml), used as fat extraction solvent was taken in round bottom flask. Soxhlet apparatus was set up. Crude fat content in 100g of sample was calculated using following formula

$$\text{Crude fat content} = \frac{Wfr - Wir}{Wts - Wt} \text{ X } 100$$

Where, Wt = weight of empty thimble, Wts = weight of thimble + sample, Wir = initial weight of round bottom flask, Wfr = final weight of round bottom flask.

Crude fiber

Acid base digestion method was employed for determination of cruder fiber content of samples. A 2g of sample was boiled in 0.1M HCl and then treated with 0.3M sodium hydroxide. The samples were then put in muffle furnace at 550°C for 5 hours. Crude fiber content in 100g sample was calculated using following formula

$$\text{Crude fiber content} = \frac{Wcr - Wcs}{Ws} \text{X } 100$$

Where, Ws = weight of sample, Wcs = weight of crucible with ash, Wcr = weight of crucible with residue after acid base digestion

Dietary Fiber

Air-dried sample (in triplicate) was weighed 500 mg and transferred in to beakers of the refluxing apparatus. To this 100 ml neutral detergent solution was added and heated to boiling. As it will start boiling, the heat was reduced to avoid foaming and allowed to reflux for 60 minutes. The solution was filtered through a weighed gooch crucible with minimum of hot water. Then it was washed with acetone in the same manner. The crucible was dried in hot air oven at 100o C for 8 hours and weighed after cooling.

$$\text{NDF (\%)} = \frac{(\text{Wt.of crucible + fiber content}) - \text{Wt.of crucible}}{\text{Weight of sample (g)}} \text{ X } 100$$

Vitamin C

N-bromosuccinimide (NBS) method for determination of vitamin C as given by Barakat *et al*. 1955 and Miranda *et al*. (2010) was used for determination of vitamin C in quinoa samples. Slight modifications were made in analysis accordingly. The method includes preparation of standard ascorbic acid solution, standardization of NBS with ascorbic acid and estimation of ascorbic acid in sample extract. a) Preparation of standard ascorbic acid: Standard ascorbic acid of concentration0.4mg ml-1 was prepared by dissolving 200mg ascorbic acid in 500 ml distilled water. b) Standardization of NBS Solution: Standard ascorbic acid solution (20ml) was added to a flask containing 4 ml of 4% potassium iodide solution (KI), 1.6 ml of 10% acetic acid (CH3COONa), 4 drops of 1% starch (used as an indicator) and 25 ml distilled water.

It was then titrated with NBS (0.2mg ml-1). Appearance of permanent blue colour was considered as end point of titration. c) Estimation of ascorbic acid in sample: Quinoa extracts, acidified with 0.4 g oxalic acid was added to a flask containing 10 ml of 4% potassium iodide solution (KI), 4 ml of 10% acetic acid (CH3COONa), 4 drops of 1% starch (used as an indicator) and 40 ml distilled water. Final vitamin C content was expressed as mg 100^{-1} using following equation:

$$\text{Vit C content} = \frac{\text{concentration of standard X volume of NBS ascorbic acid solution corresponding to quinoa extract (ml)}}{\text{volume of NBS corresponding to std ascorbic acid solution(ml)} \text{ X Sample mass (g)}}$$

β-carotene

One gram sample was extracted with petroleum ether (60-80oC) and acetone (3:2) by grinding with sand in 50 ml silica dish with a glass mortar. Extract was decanted in to a 50 ml

volumetric flask and extraction was continued 4-5 times till all fat-soluble pigments was completely dissolved. Volume was adjusted to 50 ml and absorbance was read at 450 nm against a suitable blank. The results was expressed in terms of beta- carotene.

$$\beta\text{ -Carotene (µg/ 100g)} = \frac{\text{O.D.X 13.9 X 104 X 100}}{\text{Wt of sample X 560}}$$

Result and Observation

By using the above procedure the values of Moisture, Carbohydrate, Crude fat, Crude protein, Ash, Crude fibre were calculated as Proximate composition of mixture sample of quinoa and Ragi flour while Nutritional composition of mixture sample of quinoa and Ragi flour were recorded in Dietary fiber, β-Carotene and Vitamin C and their mean were tabulated and graph were drawn to measure their trends.

Table 1: Proximate composition of mixture sample of quinoa and Ragi flour

	Moisture (g/100g)	Carbohydrate (g/100g)	Crude fat (g/100g)	Crude protein (g/100g)	Ash (g/100g)	Crude Fibre (g/100g)
Mix A	11.30	65.11	5.17	12.54	3.19	2.62
Mix B	12.36	69.89	4.35	13.18	3.21	2.96
Mix C	9.29	66.25	4.02	14.96	3.92	3.32

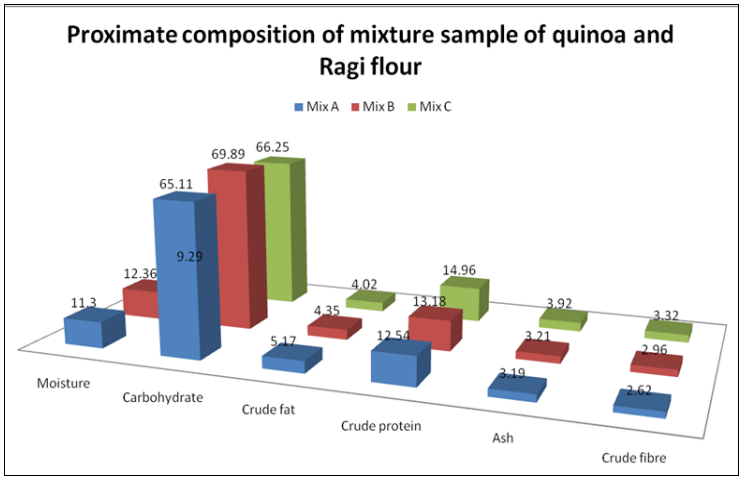

Fig 1: Proximate composition of mixture sample of quinoa and Ragi flour

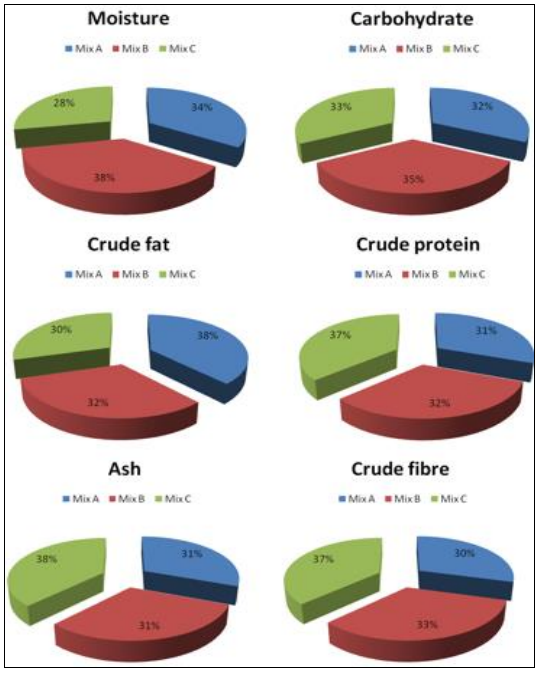

Fig 2: Comparative analysis of Proximate composition of mixture sample of quinoa and Ragi flour

From above table and figure the result has been depicted that moisture content of the mixture a is 11.30 while that of mixture B is 12.36 while that for mixture C is 9.29. For the values of Carbohydrate present in the mixture the value of the mixture a is 65.11 while that of mixture B is 69.89 while that for mixture C is 66.25. The crude fat value of the mixture a is 5.17 while that of mixture B is 4.35 while that for mixture C is 4.02. The crude protein of the mixture a is 12.54 while that of mixture B is 13.18 while that for mixture C is 14.96. The total ash content of the mixture a is 3.19 while that of mixture B is 3.21 while that for mixture C is 3.92. The crude fiber values of the mixture a is 2.62 while that of mixture B is 2.96 while that for mixture C is 3.32.

Table 2: Nutritional composition of mixture sample of quinoa and Ragi flour

	Dietary fiber (g/100g)	β-Carotene (µg/100g)	Vitamin C (mg/100g)
Mix A	10.26	535.64	13.43
Mix B	11.29	589.23	14.56
Mix C	9.24	531.26	9.45

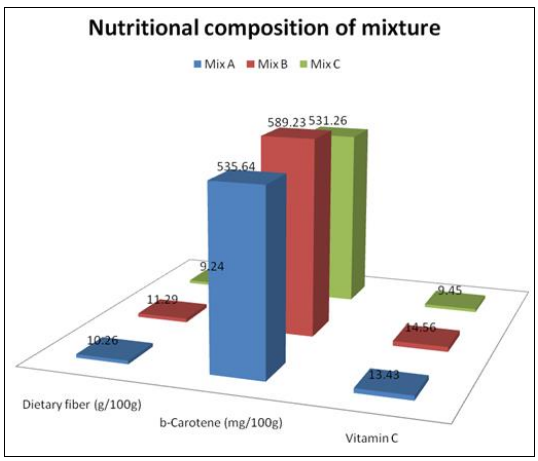

Fig 3: Nutritional composition of mixture sample of quinoa and Ragi flour

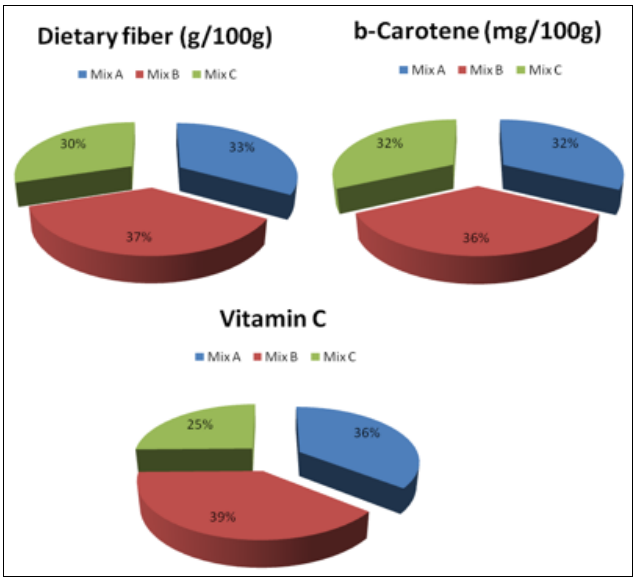

Fig 4: Nutritional composition of proximate composition of mixture sample of quinoa and Ragi flour

From above table 2 and figure 3 and 4 the result has been depicted that dietary fiber of the mixture a is 10.26 while that of mixture B is 11.29 while that for mixture C is 9.24. The β-Carotene values fiber of the mixture a is 535.64 while that of mixture B is 589.23 while that for mixture C is 531.26. The corresponding values for the mixture a is 13.43 while that of mixture B is 14.56 while that for mixture C is 9.45.

Conclusion

The main conclusion has been drawn from the above experiments that the Mixture B that contain 50% of Quinoa and 50% of Ragi has more nutritional capacity than other two mixture ratio.

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