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Short Communication

Correlation study between Organolepticand Nutritional Qualities of Multi-Grain Dalia blended with Germinated Wheat, Oat and Green gram

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A vast majority of the population in developing and under-developed countries do not have adequate nutrition to sustain a healthy life. Cereals are limited in essential amino acids such as lysine even though rich in Threonine and Tryptophan, while most oil seeds and legumes are rich in lysine and deficient in sulphur containing amino acids. Therefore, the combination of cereals and pulses in formulation of Dalia gives a nutritious food containing all the amino acids. The critical period where children develop malnutrition coincides with the introduction of complementary foods, which are nutritionally inadequate in many developing countries.The food legumes are major sources of protein and other nutrients in the diets of many developing countries. However, their role appears to be limited by several factors (Elias and Bressani) including low protein digestibility and flatulence .In many parts of the world, legumes are often consumed after germination, during which process the proteins are hydrolyzed to peptides and amino acids, due to protease activity, while the carbohydrates are converted to simpler sugars. Germination is a natural process occurred during growth period of seeds in which they meet the minimum condition for growth and development (Sangronis et al., 2006). During this period, reserve materials are degraded, commonly used for respiration and synthesis of new cells prior to developing embryo. Several studies on the effect of germination on legumes found that germination can increase protein content and dietary fiber; reduce tannin and phytic acid content and increase mineral bioavailability[1,3]. In cereal grains, germination increase oligosaccharides and amino acids concentration as observed in barley[4], wheat[5], oat and rice[2]. Legumes and cereals were used as these food groups provide significant amount of macro- and micronutrients to human. Therefore, this study aims to study the effect of germinated grain mixture of legume (Mung) and cereals (wheat and oat) on proximate content and quality of multigrain Dalia.

Wheat and green gram were cleaned to remove the dirt, dust and foreign matter by winnowing. The cleaned grains were then ground in vertical metallic disc grinder consisting of one stationary and one rotating discs, and sieved using sieves of different sizes to obtain coarse grits of similar size. The oat grains were milled to remove the shells, cleaned and polished to obtained clean grains. The grains were then subjected for further grinding to obtain grits. The particle size of the grits was varied by adjusting the clearance between the plates. Fine flour was removed by sieving and particle size distribution of grits was determined by passing it through standard sieves of different mesh size (22, 25, 30, and 44).

Table 1 Different combinations of cereal and legume grains for the manufacture of multigrain Dalia

Treatment combinations	Wheat	Green gram	Oat
T_1	100	-	-
T_2	80	20	-
T_3	80	-	20
T_4	70	15	15
T_5	60	30	10
T_6	50	20	30

Development and standardization of multigrain Dalia

Preliminary studies were conducted to standardize the formulation for the development of the different cereal-pulses based Dalia. Multigrain Dalia was prepared from different grits of wheat, green gram and oat, using above different combination [Table 1]. After mixing properly they were subjected to sensory as well as nutritional evaluations.

The grains of wheat, oat and green gram were taken and draw grains (after winnowing) were shortened, then cleaning and Washing of grains were done after that grains were Soaked/Steeped for 12 hr at 25ºC then sprouted (23ºC,100%Rh) grains were Washed/drained and then allowed for oven drying for 7-8 hr, at 60ºC. After that Dry Milling and Sieving was done. After Standardization of the size of grits and finally after the Weighing and Blending Dalia was Cooked.

All the combinations of Dalia were cooked respectively in boiling water at a ratio of grits to water 1:8 (w/v). The Organoleptic properties of nutritious Dalia were evaluated by the panel of 10 judges based on the sensory attributes of colour and appearance, taste, flavour, mouth feel and overall acceptability. The evaluation was done on a nine point hedonic scale.

The moisture content, fat content and crude protein contents of the samples were estimated by the standard methods. The total carbohydrate in the samples was estimated by hydrolysis method. The fibre content was determined by fibra plus – operational procedure for crude fiber. The total energy values were calculated by using values 4, 4, and 9 for protein, carbohydrate and fat respectively as follows: Total energy (k_{cal}/100g) = [(% available carbohydrates x 4) + (% protein x 4) + (% fat x 9)].

Minerals content of Dalia were obtained by calculation using table values (Gopalan et al. 1996). In this case, percentage mineral content was calculated based on the mineral content of different ingredients used in the formulation of the Dalia. The correlation coefficient (r) was calculated using standard formula.

Correlation analysis for Appearance and colour, Aroma, Taste, Texture, Overall acceptability, Bulk density (g/ml), Water absorption capacity (%), Cooking time (minute), Moisture Content (%), Crude Protein (%), Crude Fat (%), Ash (%), Carbohydrate (%), Crude Fiber (%), Energy Value (Kcal), Calcium (%), Phosphorus (%), Iron (%) are presented in table 2. Results of correlation analysis showed that Taste of multigrain Dalia had significant and positive correlation with majority studied traits. The highest positive correlation were observed between Crude Fibre (%) and Calcium (mg/100g of Dalia) (r = 0.992**), between Ash (%) and Energy Value (Kcal) (r = 0.990**) and between Crude Protein(%) and Phosphorus(mg/100g of Dalia), (r = 0.988**). Also results showed that significantly positive correlations were between Crude Fibre (%)& Iron(mg/100g of Dalia), (r=0.974**), Calcium(mg/100g of Dalia)& Iron(mg/100g of Dalia) (r=0.971**), Appearance & colour & Texture (r = 0.925**), Appearance & colour & Taste (r = 0.910**), Taste & Texture (r = 0.885**), Appearance &

colour & Calcium(mg/100g of Dalia) (r = 0.869**), Appearance & colour & Crude Fibre (%) (r =0.868**), Crude Fat (%)& Crude Fibre (%) (r = 0.862**), Crude Fat (%)& Iron(mg/100g of Dalia) (r = 0.857**), Aroma & Overall acceptability (r = 0.852**), Crude Fat (%)& Calcium(mg/100g of Dalia) (r = 0.796**), Appearance & colour & Iron(mg/100g of Dalia) (r = 0.795**), Texture & Crude Fibre (%) (r = 0.755**), Aroma & Texture (r = 0.738**), Energy Value (Kcal) &Phosphorus (mg/100g of Dalia) (r = 0.726**), Ash (%) & Phosphorus (mg/100g of Dalia) (r = 0.716**), Texture & Calcium (mg/100g of Dalia) (r = 0.712**), Aroma & Crude Fat (%) (r = 0.712), Aroma & Taste (r = 0.712**) and Aroma &Iron (mg/100g of Dalia) (r = 0.695**) whereas Texture & Crude Fat (%) (r = 0.693**), Crude Protein (%) & Calcium (mg/100g of Dalia) (r = 0.683**), Taste & Crude Fibre (%) (0.665), Texture &Iron (mg/100g of Dalia) (0.661), Appearance & colour & Aroma (r = 660**) and Carbohydrate (%) & Calcium (mg/100g of Dalia) (r = -0.943**), Carbohydrate (%)& Crude Fibre (%) (r = -0.923**), Carbohydrate (%) & Iron (mg/100g of Dalia) (r = -0.905**), Appearance & colour & Carbohydrate (%) (r = -0.863**), Crude Protein (%)& Carbohydrate (%) (r = -0.722**), Crude Fat (%)& Ash (%) (r = -0.717**), Crude Fat (%) & Energy Value (Kcal) (r = -0.711**), Texture & Carbohydrate (%) (r = -0.706**), Crude Fat (%)& Carbohydrate (%) (r = -0.694**), was significant but these attributes showed negative relationship among themselves. In general a significant positive correlation was observed between above mentioned qualitative parameters of multigrain Dalia. However, most of the parameters during the study were showed negative and non-significant correlation.

Table 2 Correlation matrix among Sensory, Physical, and Nutritional qualities of multi-grain Dalia formulated from a mixture of Germinated cereals and pulse grains.

Var.	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	$X1_{11}$	X_{12}	X_{13}	X_{14}
X_1	1	0.660	0.910	0.925	0.483	0.636	0.638	-0.013	-0.863	0.868	-0.071	0.869	0.536	0.795
X_2		1	0.712	0.738	0.852	0.114	0.712	-0.429	-0.646	0.635	-0.449	0.592	-0.002	0.695
X_3			1	0.885	0.656	0.485	0.471	0.041	-0.642	0.665	-0.041	0.661	0.407	0.625
X_4				1	0.511	0.304	0.693	-0.272	-0.706	0.755	-0.353	0.712	0.191	0.661
X_5					1	0.065	0.596	-0.381	-0.405	0.515	-0.392	0.482	-0.024	0.634
X_6						1	0.105	0.609	-0.722	0.589	0.619	0.683	0.988	0.570
X_7							1	-0.717	-0.694	0.862	-0.711	0.796	-0.040	0.857
X_8								1	0.038	-0.267	0.990	-0.152	0.716	-0.281
X_9									1	-0.923	0.028	-0.943	-0.617	-0.905
X_{10}										1	-0.267	0.992	0.464	0.974
X_{11}											1	-0.147	0.726	-0.261
X_{12}												1	0.569	0.971
X_{13}													1	0.447
X_{14}														1

X_1: Appearance & colour X_2: Aroma X_3: Taste X_4: Texture X_5: Overall acceptability X_6: Crude Protein (%) X_7: Crude Fat (%) X_8: Ash (%) X_9: Carbohydrate (%) X_{10}: Crude Fibre (%) X_{11}: Energy Value (Kcal) X_{12}: Calcium (mg/100g of Dalia) X_{13}: Phosphorus (mg/100g of Dalia) X_{14}: Iron (mg/100g of Dalia

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