**Selected physical characteristics of food grains and its preparation for further disease management**

**Abstract: -** The Present research was done to study the role of selective physical characteristics as particle size of flour, weight and numbers of grains per 100 g , differentiation of edible and inedible portions, water absorption ,water required for dough ,Dough weight, Gluten content, serving size, cooked weight , cooking time and required oil for preparation per serving, sensory attributes for overall acceptability of blended flour and its preparation for further disease management. Commonly consumed Food grains of particular variety as Wheat(RJ3077)Pearl Millet(RHB121),Maize(Mahi Kanchan),Foxtail millet(SR11),Bengal gram(Dahod yellow)and Barley(RD2035)were selected and purchased from Agriculture Research Stations of State Agriculture Universities. Physical and sensory parameters were assessed by standard methods. Products were evaluated acceptable by panel of Judges. Weight of seeds were varied from 0.25g (Foxtail Millet) to 23.27g (Maize).Incase of flour it was visa versa, Sizes were ranged from 0.14 to 0.36mm for Maize and Foxtail millet respectively. Amount of water was higher than amount of flour for dough preparations. Gluten content was observed in wheat and its blends only which boost chapati making quality. It can be concluded that food can be selected for consumption as per diseased conditions and food preferences. Key Words:-particle Size, Dough, Physical Characteristics

**Introduction: -** The concept of Glycemic Index is known to scientific community. Glycemic Index is carbohydrate ranking of the foods. It is calculated on the basis of blood glucose response of food. Glycemic Index of a food varies from food to food. This variason is due to physical and chemical properties of the foods and its products. As per incremental in processing status of a food the Glycemic Index will increase. Here is the major role of particle size of the food. Now research is continued to know the association of food composition, water mobility, structure of food, moisture content, water absorption, availability of type of carbohydrate. So the processing of food grains not only major determinant of the Glycemic and Insulinemic response but affects the level of satiety of the products.(Brehnan and Brehnan 2009) So the present study was planned to evaluate the concerned physical characterics of food grains and its flours.

**Methods and Materials**:-Present study was conducted at Deptt. of foods and Nutrition, MPUAT, Udaipur. Commonly consumed food grains, Wheat(RJ3077)Pearl Millet(RHB121),Maize(Mahi Kanchan),Foxtail millet(SR11),Bengal gram(Dahod yellow)and Barley(RD2035) were selected and purchased from ARS of MPUAT Udaipur and ARS Durgapura SKNAU Jobner, Jaipur for study(Table-1). Basic Food grains were mixed with bengal gram and bengal gram and barley in such proportions by different trials which was appropriate and acceptable for chapati making. Physical Characteristics of food grains as weight and numbers of grains per 100 g, differentiation of edible and inedible portions were assessed at College of Agriculture and technology, particle size of flour, water absorption ,water required for dough ,Dough weight, Gluten content, serving size, cooked weight , cooking time and required oil for preparation per serving, sensory attributes for overall acceptability at Dept of Foods and Nutrition, MPUAT, Udaipur. Standard methods were adopted to assess Physical characteristics (Sathe 1999), Water absorption and Gluten content (AOAC, 1965) and sensory evaluation by selected and trained panel of judges (Griswold 1962).Willing persons were selected and trained for sensory evaluation panel.

**Results and Discussions**:- Blended flours were assessed for its physical parameters. Commonly used food grains were selected to develop blended flour .Blended flour were mixed with Bengal gram and bengalgram and barley in various proportions 9:1. 4:1, 7:3, 1:1 for acceptable chapati making quality. All these were not acceptable for preparation for chapati as these were difficult for rolling, cracks on edges hard texture after roasting. After several tests proportions of 3:2 and 3:1:1 were selected to mix basic grain to Bengal gram and bengalgram and barley. Food grains and flours were assessed for their physical characteristics for management for further utilization and disease management. The cost of the flours was calculated considering by the cost of the grain. Cost of processing, packaging, transportation and labour had not been considered as their cost will depend upon of the product one wants to produce for commercialization. Profit and taxation part had also been considered while calculating the cost as these is dependent on various factors. The cost of food grains purchased varied from INR4kg for maize to INR 15/Kg for foxtail. Cost of all the blended were higher because of addition of Bengal gram which was purchased at the rate of INR22/Kg.(Table-2&3).As per Table 2&3-The amount of water required to prepare the dough was maximum (67ml) in all the blends of pearl millet. Amount of water was higher than amount of flour. In case of maize combination with barley the amount of water was reduced (47.6ml). Cooked weight and cooking time (Table-4-)of chapati was ranged from 67.4(F+B) to 88.59(M+B) and2(W) to 5 minutes(P,M,F and F+B).Weight of the dough taken after half an hour revealed that maximum weight was of the dough of maize combinations while minimum was for foxtail. Dough weight of W+B and P+B was lower than only W and P. The difference may be due to the water absorption capacity of the millets. The difference may be due to amount of flour, water required for dough, water absorption and water retention after cooking. The physical characteristics of flour revealed that particle size of wheat and pearl millet was less than their blended flour where as for maize and foxtail the particle size was higher than their blended flour (Table-1). These differences in the particle size may be due to mixing of the different food grains to prepare the blended flour however the difference ranged between 0.14 -0.30.As per the water absorption by the flour highest amount of water was absorbed by maize and its blended flour and lowest by foxtail. Addition of Bengal gram and barley or bengalgram alone reduced the water absorption in blended flours. The results show that bengalgram and barley absorb less water in comparison to the cereals. Gluten was formed in wheat and its blend only it made the chapati soft and easy to roll. Overall acceptability of chapati ranged from 7.1-7.8 point as liked moderately to liked very much on nine point hedonic scale (Fig-1-).

As per collier and odea 1980 by changing the particle size of the some foods blood glucose response of the food also changed. The Glycemic Index(GI) of a one inch cube of potato can increase 23% by mashing the cube (wolever et al 2000).Consumption of whole apples, apple purce and apple juice results in significantly different glucose and insulin excursions.(haberetal1977).Therefore Xavier and sunyer suggested that diabetics can eat one physical form of a food but not another. Processing as grinding, rolling, pressing or oven thoroughly chewing a kernel or other starch foods can disrupt the granules and increase the GI of foods (ASPN-G1987) The application of heat and moisture affects the starch granules. Disorganization of the crystalline structure occurs as it encounters greater heat and moisture for a longer period of the time. Gelatinization, Retro gradation and milliard reactions which makes the food unavailable for digestion and absorption and affect the GI(Sievertetal1991,Annison and Topping 1994)The cooking methods affects the GI beyond the effect of mashing or pureeing the food. The heat utilized, the amount of water and the time of cooking all have a significant effect on the GI (Collings at al1981, Valler etal1984).

**Conclusion**:-It can be concluded that flour can be selected for consumption as per diseased conditions and personal food preferences. It has great potential for commercialization.

**Statements and Declarations**:-Author is the main researcher of the conducted Research work and prepares the manuscript. Author does not have any conflict of interest. No fund is received to prepare and publish the manuscript. Willing candidates were Selected and trained as panel of judges for sensory evaluation of the products

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**Table: 1-Physical Characteristics of the food grains**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| S.No | Foods Grains | Variety | Weight of 100 seeds in g | Numbers of Seeds | Inedible Portion  g | Edible Portion  g |
|  | Wheat | RJ3077 | 3.75±0.04 | 2684±6 | 1.4 | 98.6 |
|  | Pearl Millet | RHB-121 | 0.69±0.0 | 2996±3.3 | 2.6 | 97.3 |
|  | Maize | MAHI KANCHAN | 23.27±0.6 | 484±0.5 | 0.9 | 99 |
|  | Foxtail Millet | SR11 | 0.25±0.48 | 3750±3.5 | 2.6 | 97.3 |
|  | Bengal Gram | DAHOD YELLOW | 17.4±0.4 | 571.6±2.1 | 3 | 97 |
|  | Barley | RD2035 | 3.9±0 | 2807±0.8 | 0.3 | 99.6 |

**Table-2-Physical Characteristics of Blended Flours**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| S No | Flours | Particle Size  (mm) | Water Absorption  (ml) | Cost(INR)/Kg |
| 1 | W  W+B  W+B+BY | 0.21  0.35  0.22 | 36.5  26.9  35.7 | 7  13  10 |
| 2 | M  M+B  M+B+BY | 0.14  0.29  0.30 | 34.1  24.7  30.7 | 5  12  9 |
| 3 | F  F+B  F+B+BY | 0.26  0.19  0.20 | 47.6  44  46 | 4  11  8 |
| 4 | P  P+B  P+B+BY | 0.36  0.24  0.23 | 14  12.5  14.5 | 15  24  21 |

W-Wheat, M-Maize, P-Pearl millet, Foxtail, B-Bengal Gram, By-Barley

Table-3-Characteristics of Blended Flours Dough

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| S No | Flours | Flour(g)/serving | Water(ml) | Dough Wt(g) | Gluten  (g/dry Wt Basis) |
| 1 | W  W+B  W+B+BY | 54.6  57.9  56.5 | 50.6  48  51.3 | 91.1  84.9  92.2 | 17  12  13 |
| 2 | M  M+B  M+B+BY | 58.7  60.6  59 | 60  47  47.6 | 106.4  104.7  105.1 | 0 |
| 3 | F  F+B  F+B+BY | 63.8  63.8  62 | 52  49.8  51.6 | 77.8  76.3  76.5 | 0 |
| 4 | P  P+B  P+B+BY | 57.6  59.9  58.3 | 67.3  67.6  67.6 | 91.7  84.7  89.1 | 0 |

Table4-Physical Characteristics of Chapati

|  |  |  |  |
| --- | --- | --- | --- |
| S. No | Type of Flour | oil  (g) | Cooked weight  (g/Time(Min) |
| 1 | W  W+B  W+B+BY | 2.2  2.2  1.8 | 88.4/2  83/3  82/3 |
| 2 | M  M+B  M+B+BY | 2.5  2.4  2.7 | 83/5  88.5/4  88/3 |
| 3 | F  F+B  F+B+BY | 2.2  2.1  2.3 | 67/5  67/5  67/4 |
| 4 | P  P+B  P+B+BY | 2.1  2.1  1.0 | 71/5  76/4  80/4 |