Studies on germ and protein concentrated of corn seeds

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Through the Egyptian government initiatives to improve farming practices in current production areas and desert reclamation to increase tillable areas, total production of cereal increased from 8 million tons in 1982 to 20.1 million tons in 2000. Wheat production increased from 2.1 million tons to 6.6 1 million tons with yield nearly doubling in the same period. At the same time maize production increased from 32 to 6.3 1 million tons with yields more doubling. These grains are often blended together and used to produce the traditional balady bread, that provide more than 65% of the caloric and protein requirements for most Egyptian consumers.Bread is one of the most important constituents of the Egyptian diet, and with an over- increasing population, the importance of producing safe, wholesome grains for the bread paramount. In parallel with using maize in production balady bread, maize considered an angle stone in the production of red meat or poultry because it consisted bout 70% of the food.Also production of starch, fructose and corn oil depends upon maize. Therefore, the present work was designed to study the substitution of part of wheat flour (82% or 72%) by using corn flour, corn germ and protein concentrate. Moreover studying the effect of addition corn germ (full- fat or low fat), protein concentrate to yellow corn grits to produce snack foods.The obtained results could be summarized as follows:-1-Physical characteristics of corn hybrids:The weight of 1000 kernels ranged from 315.05 to 336.77 gm and 329.78- 348.45gm for the white and yellow hybrids. The volume of 1000 kernels showed arranged of 306-315 and 316-320m1. The specific gravity showed a value ranged from 1.02 to 1.07 and 1.04- 1.09 (gm/ml). The endosperm constituted the main component followed by germ and hull with a range of 81.03- 81.31 and 81.64- 82.16%; 10.37- 11.86 and 10.98-11.41%, 5.75- 6.92% and 5.03- 5.83%, respectively. Meanwhile the aleurone content ranged from 1.3 to 1.55% and 1.08- 1.85, respectively.2-Chemical composition of corn Kernels of different hybrids.The protein content ranged between 9.13 and 9.88% for the white hybrids and 9.56- 10.31% for yellow ones. The hexane extract ranged from 4.21 to 5.04% and 4.41- 5.32% for the white and yellow hybrids, respectively.Ash content, fiber and total carbohydrates showed a range of (2.11- 2.76% and 2.31- 2.81% and 2.39- 2.93%) and (2.53- 2.87% and 79.72- 81.66% and 78.69- 81.11%) for the white and yellow hybrids, respectively.3-Chemical Composition of corn kernels components of different hybrids.Germ was characterized with the highest amounts of protein, hexane extract and ash compared with the other corn components. Meanwhile, the endosperm was characterized with the highest amounts of carbohydrates followed by the germ. On the other hand, hull as expected contained the highest amounts of fiber. Generally a slight variation between the chemical composition of the corn kernels components.4-Approximate Chemical Composition of raw materials.Wheat flour 82% ext. had the highest content of protein (12.85%) and the lowest values of hexane extract (1.96%), crude fiber (1.98%) and ash (1.02%) compared to either white or yellow corn flour.Corn flour hybrids i.e. (triple cross 310) and (single cross 3040) were found to contain 9.88 and 10.31% for protein 79.93 and 78.69% for carbohydrates, 5.32 and 6.32 for hexane extract and 2.39 and 2.87% fiber, respectively. Meanwhile fenugreek flour contained the highest amount of fiber (9.57%), also it contained 30.71% protein, 6.32% hexane extract, 3.16% ash and 50.54% carbohydrates- low- fat soy bean flour contained 48.65% protein, 4.79% hexane extract, 4.38% fiber, 7.98% ash and 34.20% carbohydrates. The full-fat corn germs characterized by the highest amount of hexane extract, while protein concentrate had

the highest content of protein (51.58%). Wheat flour (72%SUMMARY 213ext.) was the lowest values of hexane extract (1.17%), fiber (0.63%) and ash (0.59%).5-Minerals Content of corn kernels of different hybrids.Single cross 3040 of yellow hybrids was superior in sodium, potassium, phosphorous and iron, while single cross 2010 of white hybrids superior in magnesium and zinc. Meanwhile single cross 10 was superior in manganese, while triple cross 310 superior in calcium.6-Antinutritional factors of the raw materials before and after extrusion processing.- After extrusion processing, at 180°C the phytic acid content decreased by 50.0%, 50.9% for wheat flour (72% and 82%) extraction, and by 34.4%, 34.3% for corn flour (T.C. 310 and S.C. 3040).The reduction in tannins content after extrusion processing in the fenugreek flour was 53.66% while in low- fat soybean was 59.75% the reduction of wheat flour (72% and 82%) extraction 86.17 and 81.19%, respectively. Also the reduction of corn flour (T.C. 310 and S.C. 3040) were 84.26 and 87.23%, respectively.Extrusion processing, at 180°C greatly affected the reduction of trypsin inhibitor activity. The percent reduction was 86.99% for low- fat soybean flour. Meanwhile yellow corn grits, fenugreek flour, protein concentrate, wheat flour 72% and 82% extraction showed reduction of trypsin inhibitor activity of 94.22, 93.71, 92.43, 94.55 and 93.94%, respectively.The reduction of corn germ ranged about 92.50% while of corn flour either white or yellow was 93.84% and 93.40%,respectively.Generally, the extrusion processing caused a low decrease in phytic acid, tannins and total phenols. While resulted in high decrease in trypsin inhibitor, consequently the protein digestibility increased in all raw materials.The percent of increasing was 11.65 and 11.02 % for wheat flour (72% and 82% extraction), while it was 17.20 and 16.31 % for corn flour (T.C. 310 and S.0 3040), respectively.7- Physical and chemical properties of corn oils.The commercial corn oil characterized with the highest values of refractive index (1.4726), acid value (2.02 mgKOH/gm), peroxide value (3.19 meq/Kg) and thiobarbaturic acid value (0.152) compared with either (triple cross 310 or single cross 3040) corn oil. The ratio between polyunsaturated fatty acid to saturated ones showed to be 4.23, 5.51 and 4.11 for the (T.C. 310 and S.0 3040 and commercial) corn oils respectively.Fat- soluble vitamins in corn oil such as A,E,D and K were amounted in 10.06, 0.280, 7.30 and 3.12 mg/Kg for (single cross 3040) corn oil. While, the triple cross 310 were 6.6, 0.230, 8.18 and 3.63mg/Kg, respectively. The commercial corn oil was amounted in 8.47, 0.167, 7.21 and 2.61 mg/Kg for vitamin A,E,D and K, respectively.SUMMARY 2158- Farinograph parameters of wheat flour dough (82% extraction) blended with corn flour and fenugreek flour.•The replacement of high ratio of corn flour affected the gluten network of the wheat flour. Also the mature of corn protein differ that of wheat ones. The ratio of fenugreek flour showed no strong effect on the farinograph parameters, i.e. water absorption, arrival time, dough development time, dough stability and dough weakening.9- Farinograph parameters of wheat flour dough (72% extraction)blended with corn germ and protein concentrate.•Blending with low- fat corn germ more affected farinograph parameters followed by full- fat ones and protein concentrate.•Water absorption was increased gradually with increasing the added levels of 5, 10, 15 and 20% (full- fat or low- fat) corn germ or protein concentrate.10- Extensograph parameters of wheat flour dough (82% extraction) blended with corn flour and fenugreek flour.Addition of corn flour in the presence of fenugreek flour affected all extensograph parameters to be lowest than the control. The decrease of resistance to extension was found in the range of 13.7-54.3% and 11.2-45.7% for the white and yellow corn flour, respectively. The lowest extensibility value was recorded due to blend containing 40% white corn flour followedSUMMARY 216by yellow corn flour one 30% in the presence of 5% fenugreek flour being 80 and 100 mm, respectively.Concerning the energy, all treatments resulted in the following descending order yellow corn flour (77-91) > white flour (77-85)> white corn flour with 5% fenugreek flour (71-83) > yellow corn flour with 5% fenugreek flour (79-80).11-Extensograph parameters of wheat flour dough (72% extraction) blended with corn germ and proteinconcentrate.The resistance to extension of dough was decreased with increasing the levels of protein concentrate, proportional number reflect the improvement of blending with different protein quality and quantity.12-Visco amylograph parameters:Addition of corn flour with fenugreek flour to wheat flour (82% ext) at levels of 10, 15, 20, 25, 30 and 40% in the presence of 1% or 5% fenugreek flour increased the degree of transformation and viscosity at 50°C while it decreased the maximum viscosity and degree of maximum viscosity andviscosity at 95°C .Addition of corn germ (full- fat or low- fat) and protein

concentrate to wheat flour (72% ext.) increased the degree of transformation and viscosity at 50°C of the blended dough, while it decreased the maximum viscosity, degree of maximum viscosity, viscosity at 95°C13-Falling number and liquefaction number.Addition of either white or yellow corn flour in the presence of 1% fenugreek flour to wheat flour (82% extraction) decreased the falling number compared the control. The liquefaction no. was increased by increasing the addition of either white and yellow corn flour in the presence of fenugreek flour.Addition of either full- fat or low — fat corn germ flour or protein concentrate to wheat flour (72% extraction) slightly decreased the falling number and vice versa concerning liquefaction number.14-Physical properties of balady bread and aish merahrah.The weight of balady bread and aish merahrah was increased gradually as addition of blends was increased.The volume of balady bread was decreased as addition of blends increased from 10, 15, 20 and 25% in the presence of 1% fenugreek flour.The volume of aish merahrah increased as addition of blends increased from 30% to 40% for the white or yellow corn flour in the presence of 5% fenugreek flour. The specific volume decreased as increased of blends.15-Physical properties of pan bread and sponge cake. The fortification with full- fat, low fat corn germ or protein concentrate improved the weight, while decreased the volume and specific volume of the produced pan bread and sponge cake.The replacement by corn germ or protein concentrateincreased the weight of pan bread and sponge cake as the following sequence:Protein concentrate > low- fat corn germ > full- fat corn germ.16-Physical properties of yellow corn grits extrudates (snack foods).The fortification with low- fat white corn germ, protein concentrate with low-fat soybean flour resulted in highest value of water absorption index (7.52 and 7.86mligm). All fortificants resulted in water absorption index higher than the control (4.21 mllgm).Water solubility index (%) was decreased in all fortificants. Also the diameter, expansion ratio and bulk density were decreased in all fortificants compared to control.17-Chemical composition of balady bread and aish merahrah.The increasing of corn flour (white or yellow) in the presence of 1% fenugreek flour to produce balady bread was decreased protein content, fiber and total carbohydrates, while increased hexane extract and ash content. Also, the increasing of corn flour resulted in slightly increased of energy but decreased the protein digestibility.On the other hand, increasing corn flour in the presence of 5% fenugreek flour to produce aish merahrah was increased moisture content by about 24% hexan extract and ash to about two times as that of control, also a slight increase was foundconcerning energy and protein digestibility.Contrary a slight decrease was found for fiber and total carbohydrates.18-Chemical composition of pan bread and sponge cake.Chemical composition of pan bread and sponge cake fortified by (full- fat or low- fat) corn germ or protein concentrate at levels of 5, 10, 15 and 20% with wheat flour (72% extraction) led to an increase in protein, hexane extract, fiber, ash and protein digestibility. On the other hand, total energy was decreased in sponge cake, also in the blends of low- fat corn germ or protein concentrate for pan bread .The total energy was decreased compared to control but it increased in the blends of full- fat corn germ.19-Chemical composition of yellow corn grits extrudate (snack foods).Chemical composition decreased as a result of extrusion process except that of carbohydrates and ash were showed a slight increase compared with unextruded materials.20-Minerals content of balady bread and aish merahrah.The minerals content of balady bread and aish merahrah produced from wheat flour (80% ext.) blended with corn flour and fenugreek flour showed an increase of all minerals content except that of Mn.21-Minerals content of pan bread and sponge cake.Fortification of corn germ either full- fat or low fat and protein concentrate at levels of 5, 10, 15 and 20% with wheat flour (72%) resulted in an improvement of the pan bread and sponge cake by increasing its minerals content. The improvement was arranged in the following order:-Full- fat corn germ < low- fat corn germ < protein concentrate and consequently improved its nutritional value. Moreover, sponge cake resulted in the highest minerals content than that of other products due to the addition of eggs, baking powder ...etc.22-Sensory evaluation of balady bread.The Organoleptic properties of balady bread made of wheat flour (82% extraction) blended with corn flour up to 15% in the presence of 1% fenugreek flour resulted in good quality.23-Sensory evaluation of aish merahrah.The Organoleptic properties of aish merahrah made from wheat flour (82% ext.) blended with 30% or 40% corn flour in the presence of 5% fenugreek flour resulted in excellent quality aish merahrah compared with control (100% wheat flour).Also, aish merahrah was characterized with remarkable maize and fenugreek

odor and taste as compared to control.24-Sensory evaluation of pan bread.- The highly accepted pan bread can be made from a blend of wheat flour (72% ext.) substituted with 5% full- fat cornSUMMARY 221germ which obtained ” very good” in the descriptive category, followed by 10 and 15% full- fat corn germ flour were obtained (good quality).Concerning pan bread produced from low- fat corn germ or protein concentrate up to 10% gave the good quality pan bread.25-Sensory evaluation of sponge cake.Full- fat corn germ up to 15%, low- fat corn germ up to 10% and protein concentrate up to 10% produced sponge cake with good sensory characteristics.26-Sensory evaluation of extrudates (snack foods).Blending with 10% low- fat yellow corn germ mixed with 10% low- fat soybean followed by 10% low- fat yellow corn germ and the blends of 10% low- fat white corn germ mixed with 10% low- fat soybean flour produced snack foods characterized with excellent quality.27-Staling of bakery products:-Staling was determined to evaluate the blends and the results revealed that all products showed to be fresh for 48 hrs at room temperature.- from the alkaline water retention capacity (A.W.R.C) which reflect the swelling power of the starch granules and in other voids staling or retro gradation, it could be concluded that the presence of slight amounts of oil delayed the staling and improved somewhat the freshness of the produced baked products. Meanwhile balady bread and aish merahrah whichSUMMARY 222contained the fenugreek flour keeps freshness and retardation of staling. Concerning, sponge cake the presence of some oils as that found of corn germ, also the phosphoilipids which present in eggs helped in delaying the staling and retrogardation of starch.