Effect of physical and chemical characteristics of some wheat on the quality of some products

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Different wheat varieties which import for variousbaking industries were sUbjected to different analysis.Two main species 0:: wheat T. aesti v Urn and T. durum and their varieties C.W.R.S. three degree, AustralianCanadian Amber 3 degree and the Egyptian durum stork•swere chosen for studying the different factors affectingpasta industry in]~gypt. Although semolina imported byprivate sector,tCapri, Roma, Buitoni .•) were subjectedto the same analysis. Results concerning the followingitems:1- Physical and chemical properties of wheat kernelsflour and semoltna.2- Conditioning lytng time.3- Pasta browning 4- Pasta quality.were discussed in detailes:Results could be summerize as follows:1- Physical and chemical characteristics of wheat flourand pasta: 1.1. Physical characteristics of different wheat varieties: Results showed that Egyptian durum storks showedhigher values for hectoliter weight l81.1 Kg/HL)and 1000kernel weight (53.75 g) than that other hard wheat varieties.Canadian Amber grade 3 characterized by the highest vitreouspercentage (79.70%) followed by Egyptian stork's(65.33%), while Australian soft wheat are without vitreousand has the highest hectoliter weight (84.0 Kg/HL).1.2. Chemical constituents of wheat kernels,flourand pasta: Egyptian stork's flour had the higher ~oisture content(15.8%) which may be due to its higher water absorptionduring conditioning, while imported semolina moisturecontent 'was ranged between 11.8% and 12.0%.Imported semolina contained lower quantities of ashthan local durum. E9yptian stork's flour ash content ishigher than aestivum varieties wheat flour. High ashcontent has negative effect on the colour of the producedmacaroni.Crude fiber ranged between 2.0-2.6% in the differentwheat varieties. Stork's vitreous kernels showed the highestfiber content (2.6%) while Australian soft wheat hadthe lowest (2.0%). Pasta quality are affected by ashcontent and bran contamination.Durum wheats contained higher protein content thanaestivium wheats. Stork's vitreous kernels had higherprotein content than starchy. The Egyptian durum wheatstork's had 14.85% protein which was higher than T.aestivurn(13.60 and 8.84 for C.W.R.S. and Australian) and was lowerthan canadian durum wheat {15.69%}. The gluten contenthave good relation with total protein, canadian west redspring wheat showed the highest wet and dry gluten content(48.80 and 16.72%).the Australian flour had the lowest wet and drygluten (25.0 and IO.O%). In general dry gluten followedthe wet gluten up and down, storkls vitreous flour showedmore gluten content than starchy flour. Cooking qualityis related to protein content, it improves with increasingprotein content. So, patent flour from low protein ,australian wheat was not suitable for pasta production.Soluble protein fraction {alb. + glob.' shows slightlydifference between different varieties and rangedbetween 13~49% and 16.61%. Gliadins represent the majorproportion of protein fractions for flour and semolina.Glutelins contents of flour were independent of the totalprotein content but differ among cultivars. T. aestivumwheat kernels had higher starch content than durum varieties.Stork's starchy kernels showed higher starch content(64.6%) than vitreous kernels (56.9%). The alpha-amylaseactivity for the extracted flours showed the same trendof the whole wheat kernels. Semolina alpha-amylase was13.39, 15.50 and 16.40 for Roma, Duitoni and Capri whichwas lower than stork's {22.00}.The australian soft wheat and extracted flour had the lowest percentage of crude lipids (l.97 and 1.12%).The whole wheat kern~~ls had higher crude lipids content than the extracted flour or semolina because of the higher lipids content of the germ and bran.Tbe pigment content of T. aestivum varieties waslower than that of T. durum. Pigments

content of Egyptiandurum flour (7.1 ppm) have the same trend of the importedsemolina (between 6.70 and 1.4 pp m).11- Effect of conditioning lying time: The effect of cond1tioning lying time (1,~,12,18 and24 hrs.' on the ext~action rate, chemical composition andrheological properties was studied.11.1. Effect of conditioning lying time on T. durum stork's:Increasing lying time showed a slight decrease inextraction rate (72.09 to 71.78) ash content (from 1.00 to0.88%), non-reducinq sugars (from 1.75 to 0.98%), pigmentcontent (from 7.1 to 6.4 ppm J, and lipids content (from2.4 to 1.32%). In the same time moisture content andreducing sugars increased from (12.9 to 14.2%) and (0.38to 1.24%) respectively. Also, increasing conditioninglying time activate different hydrolysing enzymes. Alphaamylaseactivity increased in both wheat kernels (from 13.27 to 32.00) and flour {from 11.75 to 16.57),non-proteinnitrogen increased from ~.156 to 0.305% due to increasingproteases activity. The rheological properties of doughshowed that dough development (1.75 min) arrival (0.5 min)and stability (5.1 min) were higher in the sample conditionedfor 5 h Water absorption (60.87%) and weakeningof dough (75 B.u) showed its lowest value after 5 hconditioning lying time. Therefore "5 h conditioninglying time is preffered for Egyptian stork's yield pastaof good quality.11.2. Effect of conditioning. lying time on T. aestivium(Australian wheat):"Conditioning lying time affected on the chemicalconstituents of wheat kernels and flour. Flour yield and ash content decreased (from 74.27 to 72.78%) and (from 0.77to 0.51%) respectively, while moisture content increased(from 13.9 to 14.3%) by increasing lying time. Also a positiverelation between browning, alpha amylase activity andnon-protein nitrogen was observed. Pigment amount showed arelation between pigment content and the extraction rateThe rheological properties of the dough showed thatwater absorption was low (57.0%) and dough stability washigh (4.7 min) at ~2 h. lying time. The mixing time andarrival time increased gradually by increasing conditioninglying time which indicate that T. aestivium contains strongergluten content than T. durum. Results showed that 12 hconditioning lying time is suitable for australian T.aestivium.111- Pasta browning : The obtained results showed that T. durum stork's pasta was brown and had the highest grade colour value (lD.G) while pasta processed from imported semolina, Roma, Capri and Buiton! was yellow and had the lowest colour 3.5 ,3.6 and 3.3). T. aest Iv um pasta,1 Amoun and Mataria hadbrown and bale brown colour and lesser grade values thanstork's. 8.4 and 4.1). Brownness in macaroni was attributedto varietal, bran contamination, enzymatic and non -enzymatic reactions. Both of these factors were discussed.~. durum stork's pasta had the highest pigment loss duringprocessing '51.41%), while Roma, capri and Buitoni had thelowest loss (22.24, 14.57 and 23.0%). Spaghetti processedfrom T. aestivti!r.had 35.12% and 37.69% pigment has lossfor Amoun and Mataria respectively. Due to Stork's highest pigment loss during processing, stork's spaghe"cti had the lowest p~gment content (3.45 ppm.) comparing with otherdurum spaghetties. The obtained results showed that lipoxidase activity is higher in Egyptian durum stork's than that of the imported semolina. Also, apositive correlation between pigment loss percentage andbrownness during pasta processing was observed.IV- Pasta quality : Results of the reheological properteis showed that the semolina samples had the lowest water absorption value(between 50,0 and 50,9%) and its dough development time(D.D.T.' was higher ~han other flour samples. Stork1sD.D.T. was the lowest one <l.2min), which is due to itsweaker gluten content.Semolina and stork•s showed short periods of doughstability (between 2.0 and 2.4 min), while Amoun had thehighest dough stability (6.7 min). Stork•s had the highestdough weakening while Amoun had the lowest one. Weakingof the dough is very important factor affecting its suitabilityfor macaroni production.The cooking quality of different commercial macaroni samples were examined. Results showed that water absorption increasing of weight and swelling index for pasta processed from T. aestivium were lower than those from T.durum. The cooking loss showed a reverse correlation withwater absorption. Therefore, samples with lowest amount ofcooking loss, high protein content, slight weaking of glutenproperties and high percentage weight and volume after cookingwere of good ccoking quality.To improve pa~ta quality ascorbic acid and wheatgerm flour were added to pista dough with different concentrations. Ascorbic acid was added in concentration of 50,and ash of red and white kernels and their milling productswere sUbjected to different analysis. Results showed thatmost of the phytate was found in the germ and course bran.The ratio between phytate and fiber were higher in redwheat fine bran and shorts (12.25 and 15.43%) than whitefine bran and shorts (11.35 and 12.42%). White wheat

shortswas chosen as a source of low phytate phosphorous and highfiber content (0.77 and 6.20%). Also white wheat shortshave ability for eating than coarse and fine bran.Factors affecting phytate hydrolysis (toasting,incubation, and yeast addition) were studied. phytatephosphorous loss increased by increasing incubation time.The highest loss was obtained after 3 hrs by using tap waterat 40°C for white wheat shorts 191.6%).and 4 h at 40°Cfor red• wheat shorts: (71.9%).Also shorts incubation beforemixing with flour and other dough ingredients gave good resultsof phytate loss. in addition to dough strength preservation.Toast treatmE!nt reduces phytate phosphorous contentspecially at low shorts adding concentration lnot exceed25%). At high shorts addition concentration lmore than 25%)phytate destruction was very slow which indicate that toastinghad a limited affect on phytate destruction rates.Addition of yeast to shorts before incubation,havethe lowest value of phytate destruction due to hinderingeffect of added yeast on phytase activity.Also, incubation of shorts for 2 hrs before yeastaddition have the highest value of phytate destruction(93.14%). Addition of ascorbic acid l100 ppm) has noeffect on phytase activity, and phytate loss showed thesame percentage (25.27%J like the former treatment whichproduced bread with non incubated shorts.The rheological properties of mixing shorts l15,25 and 40%) with wheat flour were studied. Absorptionratio, dough develo~ment time, arrival time, stabilityand valorimeter values were increased by increasing shortspercentages, while dough weaking was decreased and showeda negative relationship with added shorts percentage.Extensograph results showed that shorts additionweaked dough strength and hence it is expected t? producebread of smaller volume than that of 100% wheat flour.High fiber bread with 25% shorts is preffered than others(15 and 40%) due to its moderate amount of fiber 11.18%Also its extens1.gram showed that high shorts additionweakened dough strength and produced smaller volume bread.