

Studies on harmful substances in some foods

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SUMMARY Tannins affect food taste and quality, inhibit digestive enzymes, bind protein and lead to decrease nutritional value of food. This research was carried out to study tannins in broad beans, dates (Samani, Zaghloul, and Siwi varieties) and tea (Ceylon and Indian). The study included some treatments to bind or remove tannins from the materials used. This study included the following points:

1. The determination of moisture, sugars, protein and amino acids content in the used materials and their treatments.
2. The determination of phenols and tannins using five methods.
3. Fractionation and identification of tannins and quantitative determination of separated tannins.
4. Inhibition effect of tannin fractions on trypsin, pepsin and amylase enzymes.
5. Determination of antimicrobial activity of tannin fractions on *Escherichia coli*, *Bacillus subtilis*, *Sarcina lutea*, *Nocardia*, *Streptococcus* and *Aspergillus niger*.

The obtained results showed that steeping broad bean for 16 hrs led to increase in the moisture content also baking process increased the moisture content in broad beans, while adding milk powder to the baked broad beans (BBB) reduced it. Treated dates had moisture content more than the fresh dates. Ceylon tea contained moisture (6.91%) slightly higher than Indian tea (6.6%)

Broad bean contained manitol, glucose, fructose, sucrose and maltose and raffinose. The steeping process led to increase the concentration of sugars from 23.1000 for manitol, glucose, sucrose and maltose and raffinose respectively. Steeping for 8 and 16 hrs, the baking process caused the decrease of glucose, fructose and sucrose and disappearance of mannose. All studied dates varieties contained fructose, sucrose and/or maltose. While raffinose was found in Siwi dates. Soaking dates led to increase glucose from 44.085 to 49.98% and decreased slightly raffinose and sucrose and/or maltose. Indian and Ceylon tea contained manitol, glucose, sucrose and/or maltose and raffinose with concentration of 0.060, 2.102, 0.330 and 0.042% for Indian tea and 0.080, 1.946, 0.423 and 0.035% for Ceylon tea respectively. Fructose was found in Indian tea but mannose (0.098) and trihalose (0.008%) were only found in Omani tea.

Broad beans had 23.321% protein which decreased to 22.81% by steeping for 8 and 19 hrs respectively, also decreased to 22.500% by baking process but increased by adding 2% milk powder to 23.1000. Steeping and baking process increased some amino acids and reduced other amino acids. The addition of milk powder did not increase all amino acids. Samani, Zaghloul, and Siwi dates had 0.810, 4.300 and 3.336% protein contents which decreased to 0.700, 4.077 and 3.115% by soaking in boiling water for two min. The soaking process did not reduce all amino acids but few amino acids had increased or appeared. Indian and Ceylon tea contained 20.000 and 19.099% protein respectively.

Falindis and prussian blue methods were used for determination of total phenols, prussian blue and protein precipitation methods for total tannin determination, 1,2-diphenol, FD, vanillin and prussian blue methods for non-tannin phenol determination, and 1,2-diphenol, FD, vanillin-HCl and weight methods for determination of low molecular weight tannins. The results of previous methods indicated that total phenols decreased, generally by steeping for 8 and 16 hrs but total tannins increased from 0.22 to 0.470 by steeping for a hr. Hence, determined by prussian blue methods, also Hill's method increased by steeping for 16 hrs from 0.034 and 0.052 to 0.040 and 0.064 when determined by Folin-Denis and HCL methods respectively. The LMWT increased in baked broad beans (BBB) to 0.215% when compared with BB by using FD method while

F.MWT and non-tannin phenols decreased to 0.560 and 0.076%, respectively. The addition of milk powder to BBB led to decrease of all phenols. The anthocyanidin of BB decreased from 0.366 to 0.550 and 0.30% by steeping for 8 and 16 hrs, respectively and increased by baking of broadbean seeds to 0.4-30%. The addition of milk powder improved the quality by decreasing anthocyanidin and total phenols to 0.360 and 0.54-5% when boiled. Total phenols, total tannins and LYWT decreased by boiling in water, while non-tannin phenols, HdWT and anthocyanidin increased. Total phenols decreased from 10686, 1.925 and 1.900 to 1.425, 1.699 and 10707, and LMWT decreased from 0.110, 0.197 and 0.0311 to 0.0012, 0.070 and 0.0105% for Samani, Zaghoul and Siwi fresh and treated dates respectively when determined by FD method. Total tannins decreased from 0.400, 10100 and 0.670% to 0.306, 0.697 and 0.09% for Samani, Zaghoul and Siwi fresh and treated dates, respectively when determined by prussian blue method. The non-tannin phenols increased from 1.166 to 1.201, 1.0590 and 1.89 for fresh and treated dates of Samani, Zaghoul and Siwi varieties, respectively when determined by FD method. LMWT increased from 0.0023, 0.0069 and 0.030 to 0.053, 0.095 and 0.051% for the same previous order, respectively when determined by FD method. The statistical analysis revealed that there is no significant difference between FD and prussian blue methods in determination of total phenols, also there is not significant difference between dates varieties before and after treatment. Total tannins had high significant difference when determined by prussian blue and tannin-protein precipitation methods. There is significant difference between pr-used a blue and any of other methods when determining non-tannin phenols. There is not any significant difference between the different varieties of dates with the 1r treatments. In the case of LMWT, there is not any significant difference between the different methods used. F test indicated high significant difference among the different date varieties and their treatments. LoS.D. test indicated that Siwi dates has highest value of LMWT and there is high significant difference between Siwi dates and each of Zaghoul and Bamani dates. Statistical analysis revealed that the treated dates has significant decrease in LMWT. Natural soaking dates in boiling water for 2 min lead to reduce the LMWT which in turn improve the taste of the dates, Also Siwi dates has the highest average of HdWT content and soaking in boiling water had not significant effect on LMWT. There was not significant difference in total phenols between Indian and Ceylon tea and also between prussian blue and FD methods. Total tannins did not indicate significant difference between the two varieties or between the used methods. There was high significant difference between all the used methods except the difference between 1,2-urper-d and PD. methods which was significant. Ceylon tea contained higher concentration of LMWT than Indian tea with significant difference. So the 4S-ringent taste which is related to LMWT is higher in ceylon tea than Indian tea. There was not significant difference between the used methods or between the varieties of tea. Anthocyanidin results indicated that the content of flavan compounds in Indian tea is higher than in ceylon tea. The addition of milk powder to tea beverage led to decrease all phenol fractions (non-tannin phenols, LMWT, and BMWT). By soaking of tannins in broad beans (BB) on paper chromatography, it was found that: of 10 separated spots decreased and the baking process decreased the number of separated spots from 19 to 8. The BE contained 21 spots, BBS 8 contained 13 spots, BBS 16 contained 11, BBB contained 26 and BB contained 1 spot. Date fruits LMWT of Samani dates were separated to 8 spots, of Zaghoul dates were separated to 8 spots and of Siwi dates were separated to 3 spots. By treating dates they were separated to 3, 3 and 3 spots for treated samani, Zaghoul and Siwi respectively. HdWT of samani, Zaghoul and Siwi dates were separated to 10, 8 and 19 spots and decreased by boiling to 7, 6 and 8 spots respectively. HdWT of Indian tea were separated to 12 spots and Ceylon tea were separated to 12 spots. HdWT of Indian and Ceylon tea were separated to 12 and 11 spots respectively. Inhibition of enzymes by tannins: The trypsin enzyme was inhibited by LMWT of all varieties at different percentages. The steeping of BE and addition of milk powder to BBB led to decrease the inhibition effect of tannin on OD. In treated enzymes. Also in the dates treated with boiling water, the inhibition effect of LMWT on trypsin enzyme, as inhibited by LMWT of ceylon than Indian tea. In broad bean seed had inhibition effect on ChA enzyme.

less than BB, but the addition of milk powder led to increase in inhibition effect; 3A-T on aate fruits have. Inhibition of the enzyme and this inhibition was decreased by treating the dates with boiling water. Also, HYW of the two tea varieties had inhibition effect on Ch-c'-yp.ti:in enzyme. o , Pep s Ln enz yma LMWT of steeping BBS had higher inhibition effect" " on pepsin enzyme. also the baking process revealed inhibition effect on the enzyme but the addition of milk powder reduced the inhibition effect • LMWT of date fruits had some inhibition effect on pepsin enzyme except LMWT of Siwi dates. Also Indian and Ceylon tea had high effect on the inhibition • HMWT of BBB 16 had inhibition effect (82.00%) less than BB (100%) and BBS 8 (100%): ~ By processing BB to produce BBB its HMWT had less inhibition effect (64.90%) than BB also MBBB decreased the inhibition of enzyme to 62000% "H-WT of treated dates had ~ inhibition effect on enzyme less than the fresh dates! Also ~ of 10n ~ had high inhibition effect (100%) than If -l-dian tea. (60.00%) Co oe-Aillylase enzyme, ;,;pj.ugbJ:cad beas led' to decrease in their inhibition effect of &-amylase. Baking of BB increased the inhibition of ~amylase but When milk powder was added the inhibition effect of ~amylase decreased Q:u.iWT of the treated dates had less'; inhibition effect than that of fresh dates, on the enzyme of Indian and Ceylon tea had the maximum inhibition on ~amylase enzyme! EW-VT of BBS 8 and BBB 16 ~ed to decrease the inhibition from 97% of BE to 71.66 and 66% respectively Yt also the addition of milk powder. to BBB; d to decrease the inhibition of ~amylase enzyme from 97000 to 95.00% 0.fuiJ.WT of dates had to decrease in the inhibition effect of ~amylase by treating from 40 and 27.% to 10% for each of Zaghoul and • Siwi 'dated. while in 'Samani' dates the inhibition increased from 11 to 20% • HMWT in Indian tea had inhibition effect (54%) ~ore ~han in Ceylon tea (190370%) 70 By s-Qding the effect of tannin fractions on some microorganisms (~c•herichia coli, Bacillus, ...:s mycoid, JSa.r:'cinalltia; Nocardia sp!, saccharom.yces cere171s-iaf"; 0ana Asoergillu~ ni~er) o , It was found that: LMWT of BB had antimicrobial effect on Eo c-oli ~ S-,...lu-ti.a.- only.. LMWT of BBS 8 had inhibition effect on the growth of B. mycoid, S.,! 1utia_, and Sac,_cere-iae , bQ~ the steeping for 16 hrs prevented the inhibition effect and only So lutia was inhibited, BBB had inhibition effects 011 E.coli and Bomycoido The addition of milk powder to BBB Led to low Lnh.Lb L1;wn effect on Eo mycoid and ~ IU1ia..~VT of BB had inhibition effect on A. I!Ycoid and BB2 (3 had lc',! iuhit:l.on o:ffec-t on !:!-- !DYcoid and S• IQt~\$. out the steeping for 16 hours prevented all inhibition effects. Two organisms (~:.-,mycoid and !.niger) were inhibited by HMWT of BBB (Foul Medammes) but the addition of milk powder (MBBB) led to removal of inhibition effect. LMWT of "Samani" dates had low inhibition on S-ac'ocarevisia and A. niger and by treating 'Samani' dates the inhibition was found with -Eo-co-li, Nocardia s-P. and A. niger ..LJitiWT of "Zagh.Loul," dates had low inhibition effect on Sac. cerevisiae .., this effect did not change by treating Boiling water LMWT of "Siwi" dates had inhibition effect on Sac • cerrviaiae' and A. niger and by treating E. coli and Sac. carlVisiae. were inhibited. HM~ of 'Samani' dates had low inhibition effect on A. niger but by treating the dates. no inhibition occurred; F~WT of Zaghoul dates had low inhibition effect on A•uie; aT. and by treating E.~. :!!niger was inhibited' -;,,yffillWT of • Siwi' dates and by boiling in water O' 2. Illin. tc.Ls inhibition was removed b.lit E~.col.i -was inhibited. LMWT of Indian tea had high inhibition effect on E~coli and So lutia but its HMWT had the inhibition effect on -Eo'-coli only, LUWT of Ceylon tea had inhibition effect on ~". S.lu.lia SJ.1.d Nocardia ~. t While HMWT inhibited Tn.e ,;>phenolic compounds had inhibition effect on different (microorganisms depending on the phenolic compounds. It may be "concluded that for binding or removing tannins the following treatments may be recommended: Broad bean should be steeped before baking and protein source may be added to the broad bean (Foul Medammes). Dates containing high level of tannins in matill@s-ag0 (~al stage) such as 'Siwi' variety and toreaQce the astringent taste Dates may be treated by ~ing in boiling water for two minutes. Tea had. high tannin content; ~ and the addition of milk powder prevent the effect of tannins