

# Chemical and microbiological quality of some foods

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This work aimed to evaluate some thermal processing methods for Amhat and Siwi dates in Rutab and Khalal stages, respectively, also to find a new way for developing and enhancing the shelf-life of Siwi dates (semi—thy stage) and its product (Agwa) during storage: Thermal process of canning date fruit: 1. Amhat dates: 1.1. Chemical composition: Fresh Amhat dates (Rutab stage) was preserved by canning and thermally process for different times (15, 20, 30 and 40 min) at different temperatures (100, 110 and 121°C). The chemical analysis illustrated that: 1-The means of moisture content of Amhat dates increased from 49.20% of fresh Amhat dates (rutab stage) to a range from 49.31 to 50.57% after canning Amhat dates treatments, and decreased to 49.81% during storage periods. 2-The means of total acidity increased from 0.284% of fresh Amhat dates (Rutab stage) to a range from 0.280 to 0.506% after canning Amhat dates treatments, and increased to 0.480 during storage periods. 3-The means of pH values decreased from 5.8 of fresh Amhat dates (rutab stage) to a range from 5.8 to 4.8 after canning Amhat dates treatments. Summary - 173 - 4-The means of reducing sugars decreased from 44.93% of fresh Amhat dates (rutab stage) to a range from 3.12 to 38.10% after canning Amhat dates treatments, and mean was decreased from 41.09 to 36.14% during storage periods. 5-The means of total sugars decreased from 60.81% of fresh Amhat dates (rutab stage) to a range from 61.28 to 53.27% after canning Amhat dates treatments, and mean was decreased from 57.29 to 45.28% during storage periods. 6-The means of total free amino acids decreased from 0.509% of fresh Amhat dates (rutab stage) to a range from 0.395 to 0.131% after canning Amhat dates treatments, and mean was decreased a range from 0.292 to 0.154% during storage periods. 7-The means of total free phenolic compounds increased from 0.448% of fresh Amhat dates (rutab stage) to a range from 0.501 to 0.643% after canning Amhat dates treatments, and mean was increased a range from 0.566 to 0.862% during storage periods. 8-The means of ash content decreased from 1.803% of fresh Amhat dates (rutab stage) to a range from 1.797 to 1.762% after canning Amhat dates treatments, and mean was decreased a range from 1.775 to 1.763% during storage periods. 9-The means of crude fiber content decreased from 1.257% of fresh Amhat dates (rutab stage) to a range from 1.282 to 1.252% after canning Amhat dates treatments and mean was decreased a range from 1.265 to 1.259% after 3 months storage. 10- The means of the color as ICUMSA units increased from 78.57 of fresh Amhat dates (rutab stage) to a range from 66.73 to 119.04 after canning Amhat dates treatments, and mean was increased a range from 96.50 to 145.34 during storage periods. 1.2. Organoleptic evaluation: a) The thermal process of canned Amhat dates at 100°C for 40 min. showed the best color. Unacceptable color appeared by increasing the temperature over 100°C for 40 min. b) The thermal process of cans Amhat dates at 100°C for 40 min. led to the best taste and the acceptability was decreased by increasing the temperature. c) The odor scores decreased by increasing the thermal process and by increasing the storage periods. d) The consistency of thermal process dates at 100°C for 40 min. showed the best consistency but the increase of the temperature and storage periods led to lowering the score and appearance of unacceptable consistency. 2. Siwi dates: 2.1. Chemical composition: Fresh Siwi date variety in (khalal stage) was canned in a sugar solution (25%) and thermal process for different times (20, 30 and 40 min) at different temperatures (100, 105 and 110°C) Summary - 175 - The chemical analysis illustrated that: 1-The means of moisture content increased from 61.6% of fresh Siwi dates to a

range from 62.80 to 63.10 /0 after canning Siwi dates treatments, and mean was decreased a range from 62.93 to 62.90% after 9 months storage.2-The means of total acidity increased from 0.179% of fresh Siwi dates to a range from 0.775 to 0.864% after canning Siwi dates treatments and mean was increased a range from 0.821 to 0.963% after 9 months storage.3-The means of pH values decreased from 5.6 of fresh dates to a range from 4.20 to 3.90 after canning Siwi dates treatments and mean was decreased a range from 4.04 to 3.39 after 9 months storage.4-The means of reducing sugars decreased from 45.16% of fresh Siwi dates to a range from 63.31 to 52.79% after canned treatments Siwi dates, and mean was decreased a range from 58.07 to 41.45% after 9 months storage.5-The means of total sugars decreased from 53.08% of fresh Siwi dates to a range from 72.76 to 52.98% after canning dates treatments, and the means of the solution of aiming dates treatments and mean was decreased a range from 63.14 to 53.45% after 9 months storage.6-The means of total free amino acids decreased from 1.646% of fresh Siwi dates to a range from 0.616 to 0.31 after canning dates treatments, and mean was decreased a range from 0.484 to 0.382% after 9 months storage. Summary - 176 -7-The means of total free phenolic compounds decreased from 0.527% of fresh Siwi dates to a range from 0.568 to 0.449% after canning dates treatments, and mean was decreased a range from 0.519 to 0.458% after 9 months storage.8-The means of ash content decreased from 1.146% of fresh Siwi dates to a range from 1.132 to 1.124% after canning dates treatments and mean was decreased a range from 1.129 to 1.125% after 9 months storage.9-The means of crude fiber content decreased from 3.370% of fresh Siwi dates to a range from 3.336 to 3.210% after canning dates treatments and mean was decreased a range from 3.261 to 3.181 after 9 months storage.10-The means of color (ICUMSA units) increased from 65.98 of fresh Siwi dates to a range from 37.82 to 65.73 after canning dates treatments and mean was increased a range from 51.76 to 60.28 after 9 months storage.2.2. Organoleptic evaluation:a)The treated canned Siwi dates at 100°C for 40 min. led to the best color (score) and by storage periods of the canned dates at 100°C for 40 min. and at 110°C for 20 min. led to the same high score for color.b)The taste of canned Siwi dates got (obtained) the maximum score by thermal process at 100°C for 40 min.c)The odor was decreased by increasing the temperature and time of thermal process. The treated cans at 110°C for 20 min and at 100°C for 40 min led to the maximum score and no significant differences between the previous treatments.d)The consistency was the best of treated Siwi dates cans at 110°C for 20 min., and also by storage period.3. Heat penetration for canned Amhat and Siwi dates: 3.1. Pectin methylesterase:Pectin methylesterase is more heat resistant than the sporulating bacteria like lactobacilli and leuconostoc, yeast and molds.3.2. Heat penetration data:Heat penetration data were plotted as heating and cooling curves on semi log paper. The  $f_h$ ,  $J_i$ ,  $f_c$  and were calculated and tabulated. Data indicated that the slowest point is at 1/4 height from the can bottom (0 65 x 110 mm) that the highest  $f_h$  values obtained at this point were 40.65 and 15.02 min. for Amhat and Siwi dates respectively.3.3. Evaluation of the optimum thermal process time:Calculated F value which covered 12D for methyl pectin esterase, this means that it will be the F value required to retain 101% of this enzyme. Using D100 value of 0.34 min resulted in calculated F value of 4.08 min.The required optimum process time were 52.45, 29.11 min. for Amhat and Siwi dates, respectively.3.4. Constructing thermal process schedule for optimum thermal process time at different retort and initial temperatures:a)The obtained heat penetration data at lab at the slowest point were used to predict other heat penetration data at other retort and initial temperatures applying equations of (Schultz and Olson 1940).b)New data were plotted for different retort temperatures (100, 105 and 110°C) at different initial temperatures (40, 45, 50, 55, 60, 65, 70 and 75°C).c)New parameters were obtained and new calculations were carried out.d)The optimum thermal process times for Amhat dates at 100, 105 and 110°C retort temperature were 48.26, 36.69 and 18.01 min. respectively at 40°C initial temperature. Also it was 32.81, 23.04 and 5.77 min. respectively at 75°C initial temperature and for Siwi dates canned at 100,105 and 110°C retort temperature while at 40°C initial temperature were 23.73,7.99 and 1.11 min., respectively.4. Effect of microwave heating on Siwi dates (semi-dry)and its product:4.1. Chemical composition of tamre and pressed Siwi dates:The semi dry Siwi date variety and its pressed product (with local name Agwa) were washed by tap water (30°C) and hot water (90°C) for two minutes, then dried, treated in Summary - 179 -microwave oven for 1.0 (76°C), 1.5 (94°C), 2.0(102°C and 2.5 (122°C) minThe

results obtained showed that:1-The means of moisture content of Siwi dates (tamre stage) was 16.59% after washing at 30°C for 2.0 min. and decreased a range from 15.69 to 11.19% after heating in microwave oven in zero time, and the moisture content of pressed Siwi dates was 17.39% after washing at 30°C for 2.0 min. and decreased a range from 15.62 to 12.71% after heating in microwave oven in zero time.2-The means of total acidity of Siwi dates (tamre stage) increased a range from 0.320 to 0.447% and increased a range from 0.340 to 0.411% of dates treatments and during storage periods respectively, and the pressed Siwi dates increased a range from 0.357 to 0.478% and increased a range from 0.398 to 0.468% of treatments pressed Siwi dates and during storage periods, respectively.3-The means of pH values of treatments of Siwi date (tamre stage) decreased a range from 5.63 to 5.55 and decreased a range from 5.63 to 5.52 during storage periods. While the means of pH values of pressed Siwi dates treatments and during storage periods decreased a range from 5.70 to 5.23 and 5.58 to 5.52, respectively.4-The means of reducing sugar of (tamre stage) Siwi dates treatments and during storage periods decreased a range from 40.84 to 36.02% and a range from 40.13 to 38.41% respectively and for pressed Siwi dates treatments and during storage periods decreased a range from 43.09 to 37.47% and a range from 41.49 to 39.49%, respectively.5-The means of total sugars of (tamre stage) Siwi dates treatments and during storage periods decreased a range from 58.16 to 51.21% and a range from 59.23 to 52.98% respectively, and for pressed Siwi dates treatments and during storage periods were decreased a range from 58.51 to 52.44% and a range from 57.47 to 55.17%, respectively.6-The means of total free amino acid of Siwi dates (tamre stage) treatments and during storage periods decreased a range from 0.297 to 0.203% and a range from 0.321 to 0.138% respectively, and the means of pressed Siwi dates treatments and during storage decreased a range from 0.343 to 0.197% and from 0.367 to 0.141%, respectively.7-The means of total free phenolic compounds of tamre Siwi dates treatments and during storage periods decreased a range from 0.472 to 0.387% and a range from 0.475 to 0.409% respectively, and the means of pressed Siwi dates treatments and during storage periods decreased a range from 0.470 to 0.364% and a range from 0.495 to 0.427%, respectively.8-The means of ash content of tamre Siwi dates treatments and during storage periods decreased a range from 1.304 to 1.275% and from 1.293 to 1.281% respectively, and the pressed Siwi dates treatments and during storage periods decreased a range from 1.198 to 1.182% and a range from 1.182 to 1.171%, respectively.9-The means of crude fiber content of tamre Siwi dates treatments and during storage periods decreased a range from 2.680 to 2.393% and a range from 2.542 to 2.417% respectively, and the means of crude fiber content of pressed Siwi dates treatments and during storage periods decreased a range from 2.545 to 2.434% and a range from 2.469 to 2.456%, respectively.10-The means of the color measurement as ICUMS units of tamre Siwi dates treatments and during storage periods increased a range from 58.07 to 81.18 and a range from 66.54 to 71.45 respectively, and for the pressed Siwi dates treatments and during storage increased a range from 60.05 to 107.08 and ranged from 73.31 to 77.85, respectively.

**4.2. Organoleptic evaluation of tamre and pressed Siwi date:**

**4.2.1. Tamre Siwi dates:**

a-The best color of tamre Siwi dates treatments as clear in dates treated by hot water at 90°C for 2.0 min., then microwave treatments for 1.0, 1.5 and 2.0 min.

b-The treatment of Siwi dates by hot water at 90°C for 2.0 min. showed the best taste and the microwave treatments gave good taste.

c-The treated Siwi dates by hot water at 90°C for 2.0 min. led to the best odor and the score of microwave treatments were very acceptable.

d-The acceptability of treated Siwi dates by hot water at 90°C for 2.0 min was better than of all other treatments and treated dates by microwave especially 1.0 min. had high scores which indicated to a good acceptability.

**Summary - 181 -**

**4.2.2. Pressed Siwi dates (Agwa):**

a-The treated agwa by microwave oven for 1.5 min. led to the best color. The color of agwa was decreased by increasing the storage periods.

b-The maximum scores of the taste were found for treated agwa by microwave oven for 1.5 and 2.0 min. and these means were decreased by increasing the storage periods.

c-Treated agwa by microwave oven for 2.0 min led to the best odor and the means of odor decreased gradually by storage and after 9 months the enhancement of odor was appeared.

d- The acceptability showed clear enhancement for microwave treatments for 1.0, 1.5 and 2.0 min gradually and the highest mean of acceptability were found at zero time then decreased by increasing storage time except the treated dates by microwave oven for 1.5 and 2.0 min which showed enhancement

for the acceptabilities at 9 months especially after storage period for 9 months.

5. Microbiological evaluation:

5.1. Total bacterial count: Total bacterial count were  $2.60 \times 10^2$  and  $3.60 \times 10^2$  cfu/g of tap and hot water treatments of tamre Siwi dates respectively which decreased to  $1.80 \times 10^2$ ,  $1.20 \times 10^2$ ,  $9.00 \times 10^1$  and  $3.00 \times 10^1$  cfu/g of treated dates by microwave oven for 1.0, 1.5, 2.0 and 2.5 min., respectively the washed pressed Siwi dates by tap and hot water contained  $6.64 \times 10^2$  and  $5.66 \times 10^2$  cfu/g of total bacterial count which decreased to  $4.50 \times 10^2$ ,  $4.00 \times 10^2$ ,  $3.12 \times 10^2$  and  $2.50 \times 10^2$  cfu/g, respectively.

5.2. Yeast and molds: The count of yeast and molds were low in all treatments  $1.67 \times 10^2$  and  $2.15 \times 10^2$  cfu/g of tap and hot water respectively, then decreased to  $6.5 \times 10^1$ ,  $5.0 \times 10^1$ ,  $3.0 \times 10^1$  and  $1.0 \times 10^1$  cfu/g by microwave oven heating for 1.0, 1.5, 2.0 and .5 min., respectively, the same decrease was found in pressed Siwi dates especially the treated dates by microwave oven  $8.7 \times 10^1$ ,  $7.5 \times 10^1$ ,  $6.2 \times 10^1$  and  $3.0 \times 10^1$  cfu/g for 1.0, 1.5, 2.0 and .5 min., respectively.

5.3. Sporeformer bacteria: The sporeformer bacteria were very low in tap and pressed Siwi dates but were relatively less in tamre Siwi dates than pressed Siwi dates. A more decrease was observed by treating the tamre and pressed Siwi dates by microwave heating.

6. The model system for some components of dates treated by microwave oven: The model system was carried to study the affect of microwave heating on each component of food. The microwave oven effect had been done on the following components:

6.1. Glucose: The glucose was decreased gradually by increasing the microwave heating time and showed some effect on color as a result of microwave heating.

6.2. Fructose: Fructose was decreased clearly after treating by microwave heating and some effect on the color and ultraviolet wavelength were observed.

6.3. Sucrose: The increasing time of microwave heating led to more decrease in sucrose solution. The reducing sugars were increased by exposure the sucrose solution to microwave heating from 0.5 until 1.5 min. Also the color at 420 and 520 nm increased by increasing the time of microwave heating.

6.4. Starch: The reducing sugars liberated from starch treatments (treated starch by microwave heating) were increased by increasing the time of microwave heating, also the color at 420 nm was increased and optical density at 280, 290 and 300 nm was increased.

6.5. Glucose and glycine mixture: The reducing sugars was increased by increasing the time of microwave heating to 1.5 min. then decreased after 2.0 and 2.5 min. for microwave heating also free amino acid (glycine) was decreased by increasing the microwave heating. The optical density at 280, 290 and 300 nm were increased by increasing the time of microwave heating until 1.5 min. then decreased after 2.0 and 2.5 min.

6.6. Pectin: The solution of pectin was affected by microwave heating which led to increase the turbidity by increasing the time of heating.

6.7. Glycine: The increase of microwave heating led to more decrease in free amino acid (glycine solution) which was associated with the increase of color at 420, 520 nm and optical density at 280, 290 and 300 nm.

6.8. Casein: The microwave heating led to liberate the free amino acids from casein depending on the time of heating by microwave, the optical density at 420, 520, 280, 290 and 300 nm was increased by increasing the time of microwave heating.

6.9. Olive oil: Peroxide value and acid value were increased while conjugated dienes, conjugated trienes were decreased by increasing microwave heating time, but the refractive index was nearly stable.