Production of New Appetizer and Tomato Ketchup Supplemented with Some Natural Plant Sources.

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Abstract: This study was carried out to supplemented some tomato products (Tomato Ketchup) with some natural plant sources (Red Roselle extract and Tamarind extract), also to produce new appetizers from this natural plant sources, besides, evaluating the palatability of those aforementioned supplemented and new appetizers products.
The obtained results revealed that total solids of tomato ketchup supplemented with Red Roselle extract and tamarind extract were higher (50.72% and 53.03%) than tomato ketchup while tamarind ketchup had the highest total solids (56.62%). Also Red Roselle ketchup and Tomato Ketchup supplemented with Red Roselle extract had high percentage of total color density than the others. The results showed that total phenols and total flavonoids were 931.25 and 302.3 mg/100g F.W. respectively for tamarind ketchup, meanwhile total phenols and total flavonoids ranged between 343.75 to 450 and 110 to 209mg/100g F.W. for the other treatments respectively. A total of seventy phenolic compounds and nine flavonoids compound were identified with a yield ranged from 10.77mg/100g to 128.57mg/100g and from 2.44 mg/100g to 98.35mg/100g respectively. Pyrogallol was the predominant free phenolic compound in tomato ketchup. Tomato ketchup supplemented with Red Roselle extract and Red Roselle ketchup accounting for 62.09% to 80.48% of the total phenolics present, while salicylic was the predominant free phenolic acid in Tomarind ketchup (66.59%), Hesperidin was the principal flavonoid in tomato ketchup, tomato ketchup supplemented with Red Roselle extract, Red Roselle ketchup and tamarind ketchup accounted for 59.90% to 86.94% of total adhering flavonoids. The sensory evaluation referred that there was significant differences between all treatments in color, taste, odor texture and overall acceptability.**[**Ginat, El-sherif ; Elsayed M. El-Saeidy and Azza Abdel Hammed K. **Production of New Appetizer and Tomato Ketchup Supplemented with Some Natural Plant Sources.** *J Am Sci* 2013;9(8):64 69]. (ISSN: 1545-1003). http://www.jofamericanscience.org. 10

Keyword:- Appetizer- Tomato Ketchup- Red Roselle- Tamarind.

1.Introduction

World-wide tomatoes (*Lycopersicon esculentum*) constitute an important agricultural crop and an integral part of the human diet (***Rao*** et al., 1998).

More than 80% of processed tomato produced is consumed in the form of processed products such as tomato juice, paste, purée, ketchup, sauce and salsa (***Thakur*** *et al.*, 1996).

Ketchup is a descriptive term for a number of different products, which consist of various pulps, strained and seasoned fruits; Good quality ketchup is judged by flavor, consistency, uniformity and attractiveness of color. Tomato ketchup is a clean, sound product made from properly prepared strained tomatoes with spices, salt, sugars and vinegar with or without starch, onions and garlic and contains not less than 12% of tomato solids (Gupta, 1998).

Popular natural plant sources such as Red Roselle petals *Hibiscas* sabdariffal) and tamarind pulp (*Tamarind indica L.*) had good medical effect on some diseases. The previous natural plants were studied by many researchers as shown in the following literature.

Red Roselle (*Hibiseas sabdariffal*) petals extract contains gossypetin and glucoside hibiscin. The glucoside hibiscin diuretic choleretic effect as decreasing the blood viscosity, reducing blood pressure and stimulating intestinal peristalsis (***Onyenekwe*** *et al*., 1994).

Protocatechuic acid, a simple phenolic compound isolated from *H.* sabdariffa showed protective effects against cytotoxicity and genotoxicity of hepatocytes, the extract of its petals protected rats against cadmium induced liver, prostate and testis lipoperoxidation, anti-hyperlipidemic and anticancer (***Mahadevan*** *et al.*, 2009).

Tamarinds indicial (*T. indica L.*,) commonly known as tamarind. The pulp of this plant is used in cooking due to its sour taste and particularly to import flavor to savory dishes. *T. indica* is also used medicinally for gastric and digestion. The fruits and seeds of this plant showed anti-bacterial, anti-inflammatory and anti-diabetogenic effect (***Maiti*** *et al*., 2004, ***Paula*** *et al*., 2009).

Analysis of phenolic content and antioxidant activities of the various part of *T. indica* extracted with solvent of varying polarities proved information on the potential of this plant as source of phenolic antioxidants, and the medicinal use of this plant (***Razali*** *et al.*, 2012).

This study aims to utilize natural Red Roselle and *Tamarinds indica* extracts as sources of strong

antioxidant activities and supplemented tomato ketchup with it, also the study was extended to produce new products like ketchup as appetizer from these natural plant sources (Red Roselle and Tamarind) and to evaluate the palatability of these products.

2.Materials and Methods

Materials:

Tomato paste, Red Roselle petals, tamarind Pulp onion powder, garlic powder, red hot paprika powder, clove, nutmeg, sucrose and salt were obtained from local market.

Preparation of samples:

Tomato ketchup (T_1): 60 gm tomato paste, 50gm tomato juice, 15ml water, 34 gm sucrose, 13gm vinegar, 6gm salt, 17.5g red hot paprika, 3.5g onion powder, 0.5 gm Garlic powder, 0.6g clove, 0.15 nutmeg were used. All the dried materials and liquid materials were mixed and* concentrated with heat to not less 25% total soluble solids.

Tomato ketchup was supplemented with Red Roselle extract (T_2) 100gm tomato paste, 200ml Red Roselle extract, 56.79 sucrose, 22 gm vinegar, 10gm salt, 29.22 g red hot paprika, 5.8gm onion powder, 1gm garlic powder, 19 colve, 0.25 nutmeg. All the ingredients were mixed and concentrated with heat to not less 25% total soluble solids.

Tomato ketchup was supplemented with tamarind extract (T_3) 100gm tomato paste, 200 ml tamarind extract, 56.7 gm sucrose, 22gm vinegar, 10g salt, 29.22gm red hot paprika, 5.8gm onion powder, 1gm garlic powder, 1gm clove, 0.25 gm nutmeg. All the ingredients were mixed and concentrated with heat till not less 25% total soluble solids.

Red Roselle ketchup (T_4)

50g red Roselle petals were extracted with 750ml boiling water, and the taffy fibers were removed by screening. Mixing the extract with 56.79 gm sucrose, 22gm vinegar, 10gm salt, 20gm red hot paprika, 10gm onion powder, 5 gm garlic powder, 1g clove, 0.25 gm nutmeg, 7.5g starch. All the ingredients and concentrates were mixed with heat; starch was added at the end of cooking till the T.S.S reached 25%.

Tamarind ketchup (T_5)

250gm cleaned tamarind pulp was extracted with 750 ml hot water, the Taffy fibers were removed by screening. Added 20gm tomato, 56.79gm sucrose, 22gm vinegar, 10g salt, 29.22g red hot paprika, 6gm onion powder, 1gm Garlic powder, 1g clove, 0.25 gm nutmeg were added together. Tamarind extract was mixed with all the previous ingredients, and then being concentrated with heat till the T.S.S reached to 25%.

The ketchup was stored in tightly covered containers in the refrigerator for analysis.

Methods:

Moisture content, total soluble solids (T.S.S), crude fiber, ash and total acidity (as citric acid) were measured according to the A.O.A.C. (2000). Total phenolic compounds were determined using folin-denis reagent as described by ***Swain and Hillis*** (1959). The concentrations of flavonoids in methanol extract were measured spectrophotometrically at 440nm according to (***Zhisen***, 1999). Total color density (TCD) of all products (1gm was extracted by 25ml water, then filtered and the color value was measured at 420, 520 and 700nm (***Somers***, 1971, 1972). TCD= Abs420 + Abs520)-2 (Abs700).

The pH values of all ketchup products were adjusted by pH meter (Backman pH meter with glass electrode at 25°C) as described in A.O.A.C (2000). The consistency was measured at room temperature (27±1°C) in a Brook- field synchrolectric viscometer (Model DV III ultra) at 10rpm and reported in centipoises (cp). Phenolic compounds were determined by HPLC according to the method of (***Goupy et al***., 1999).

Flavonoid compounds were determined by HPLC according to the method of (Mattila et al., 2000).

All the processed ketchup products were organoleptically tested for their color, taste, odor and palatability using a scale from 1 to 10 and the decisions were as follows: excellent: (10); very good: (8-9); palatable: (6-7) and non. Palatable: (0-5) according to (***Larmond*** 1970). The collected data were recorded as means and analyzed by SPSS windows (Ver. 10.1.) using one-way ANOVA and Duncan comparisons were tested to signify differences between different samples. AP. Value <0.05 was considered statistically significant. Data were expressed as means, according to (Snedecor and Cochran 1980).

3. Results and Discussion

- Chemical and physical properties of different treatments.
- Total solid, moisture and ash contents:

Total solids content is an important factor for the production of tomato ketchup. It is well known that the higher the total solids the better will be the quality of the end product. As shown in Table (1) there is a difference in the total solids content between ketchup samples.

The tomato ketchup (T_1) had the lowest total solids content (33.35%), while the tamarind ketchup (T_5) showed the highest content (56.62%). On the other hand a moderate difference in the total solids contents accrued between the other ketchup samples T_2, T_3 and T_4, (50.72%, 53.03% and 39.29%) respectively.

Canovan and Peleg (1993) found that the total solids in Hein Tomato ketchup were 32.2% and in stop and shop tomato ketchup was 34.4%.

Also the same data of Table (1) represent the ash contents of ketchup samples: The lowest content was 1.76% for tomato ketchup supplemented with tamarind extract, while the highest content was 4.45% for the Red Roselle ketchup. Tomato ketchup, tomato ketchup supplemented with Red Roselle extract and tamarind ketchup had 3.01%, 3.12% and 2.56% ash content respectively.

These results are in agreement with those obtained by ***France ceutre de Researches Foch*** (1990), who found that ash content was 3.4%, 2.8% and 4.2%, for tomato ketchup.

Titratable acidity and pH value.

The pH value and total acidity are important factors influencing the quality of tomato ketchup. The pH values ranged between 3.16 for T_4 and 3.79 for T_1. The values obtained are in accordance with those obtained by ***Rani and Banins***, 1987, who found that the pH value for tomato ketchup ranged between 3.55 and 3.87 and by ***Porretta and Birzi*** 1995 who found that pH value for tomato ketchup was 3.78 and 3.76. Tamarind ketchup had the 10wast of pH value (2.56).

The total acidity values obtained from tested ketchup samples ranged between 0.51% and 1.26% for tomato ketchup and tomato ketchup supplemented with Red Roselle extract respectively, while T_3, T_4 and T_5 had 0.53%, 0.54% and 0.55% total acidity respectively, These hoes results are in agreement with those obtained by ***Porretta and Birzi*** (1995).

Crude Fibers and total color density:

The results obtained presented in table (1) show the total crude fibers for the ketchup samples. The crude Gibers ranged between 0.050% Red Roselle ketchup and 0.91% for tomato ketchup.

The data given in Table (1) show the total color density for the ketchup samples. Red Roselle ketchup and tomato ketchup supplemented with Red Roselle extract had the highest value of total color density (1.207 and 1.009%) compared with tomato ketchup and tomato ketchup supplemented with tamarind extract (0.853 and 0.581%) respectively. The high value of total color density of T_2 and T_4 could be related to the anthocyanine content of Red Roselle. On the other hand Tamarind ketchup had 0.709% total color density.

The viscosity of different treatments of ketchup varied from 3.104 to 4.488 cps (Table 1). The high viscosity of T_4 could be related to the highest level of total soluble solids. Tomato ketchup had 3.488 cps while T_2 and T_3 had a slight decrease of viscosity compared to tomato ketchup. A low level of viscosity was observed in tamarind ketchup (3.104 cps). ***Bartolome*** (1972) found that tomato juice consistency was significantly affected by the amount and nature of the suspended, dissolved and colloidal substances in the juice, which are in turn affected by varietals differences, cultural practices and processing techniques, also ***Gould*** (1978), stated that the variation in consistency is as a result of specific processing methods and/ or tomato variety and consequently of their physical, and chemical characteristics.

Total phenols and total Flavonoids:

Phenolic compounds are secondary plant metabolites with beneficial biological agents affecting as anti-becterial, anit-inflammatory and anit-allergic agents (Koshihara *et al*., 1983; Schramm& German; 1998). Most important is their documented action as potent antioxidant (Formica& Regleson, 1995; Rice-Evans et al., 1996).

The data of phenolic compounds of all treatments are tabulated in Table (1). Results explain that tamarind ketchup contain high amount of total phenols (931.25 mg/100g) these results are in agreement with those of ***Razali et al***. (2012), who found that total phenols content of tamarind ranged between 3.17 to 30.8mg GAE/g dried weight, while the results given in the same Table (1) show that other treatments of ketchup under investigation contained the following total phenols levels; 390, 362, 343.75 and 450mg/100g F.W. for T_1, T_2, T_3 and T_4 respectively.

The total flavonoid contents of the methanol treatments extract was determined according to a colorimetric assay. The results in (Table1) show that total flavonoids content of all treatments extract ranged from 38.3mg/100g to 302.3 mg/100g as quercetin for T_3 and T_5 respectively.

Fractions of phenolic compounds and flavonoids are tabulated in Table (2) and (3). It could be noticed that salycilic acid was the highest and major phenolic compound in tamarind ketchup (T_5), followed by vanillic acid, chlorogenic acid, ellagic acid, Ferulic acid, cinnamic acid, gallic acid and soon, while phyrogallol was the major phenolic compound in Red Roselle ketchup (T_4), tomato ketchup supplemented with Red Roselle extract (T_2) and tomato ketchup (T_1) respectively. At the same time all the treatments had different amounts of phenolic fractions compounds as shown in Table (2). ***Scherer and Godoy*** (2009) showed that gallic acid had the highest antioxidant activity index followed by chlorogenic, Caffeic and Ferulic acid. Some of these phenolic compounds such as gallic acid, pyrogallol, catechin and ellagic acid play an important role as bioactive antioxidants.

Analysis of phenolic and flavonoids compound of the various treatments of ketchup provides data on the characteristics of antioxidants present.

The results given in Table (3) show those ketchup treatments under investigation contained the following flavonoids. Hesperidin was the major flavonoid in tamarind ketchup and tomato ketchup, Followed by Re Roselle ketchup and tomato ketchup supplemented with Red Roselle extract. Hespertien and rosemarinic showed an increase in tamarind ketchup by corresponding values with other treatments. At the same time tomato ketchup had amounts of kamferol, apignen, rutin and querctrin higher than other treatments.

Organoleptic **Evaluation:**

As in all foods, the ogranoleptic taste are generally the final guide of the quality from the consumers point of view (***Jimenez et al***., 1989) Thus, it is beneficial to make a comparison between all treatments. Mean value of sensory scores namely color, taste, odor, texture and overall acceptability of prepared treatments are shown in Table (4). Significant differences were obtained among the taste samples. Analysis of variance showed that tomato ketchup (T_1) had the high score for color, taste, odor, texture and overall acceptability compared to those of the other investigated samples. The color scores of tamarind ketchup (T_5) were lower than the other ketchup products. No significant difference was observed in the means of taste for T_2 and T_3 compared to T_4 which had the lowest mean of taste compared to the others. It could be stated that tomato ketchup (T_1) and tomato ketchup supplemented with Red Roselle extract had the highest palatability compared to all other ketchup treatments while the mean score of T_3, T_4 and T_5 was lower than $T_{1 \text{ and }} T_2$ for the overall acceptability. Finally the means score of all the parameter including color, Taste, odor, texture and overall acceptability means that meaning all the previous ketchup products are acceptable according to ***Lormond*** (1970).

Table (1) Physiochemical properties of Ketchup treatments (On wet weight basis)

Ketchup treatments / Components	T_1	T_2	T_3	T_4	T_5
Total Solids %	33.35	50.72	53.03	39.39	56.62
Moisture content %	66.65	49.28	46.97	60.61	43.38
Ash content %	3.01	3.12	1.76	4.45	2.56
T.S.S%	29.90	32.60	26.00	54.7	36.80
pH Value	3.79	3.61	3.23	3.16	2.77
Total acidity (as citric acid)%	0.51	1.26	0.53	0.54	0.55
Crude Fiber%	0.91	0.052	0.380	0.050	0.709
Total color density%	0.853	1.009	0.581	1.207	0.797
* Total phenols%	390.0	362.0	343.75	450.0	931.5
** Total flavonoids%	120.0	209.3	38.3	110.0	302.3
Viscosity (CPS)	3488	3464	3264	4488	3104

T_1 : Tomato ketchup.T_2: Tomato ketchup supplemented with Red Roselle extract.
T_3: Tomato ketchup supplemented with tamarind extract.T_4: Red Roselle ketchup
T_5: Tamarind ketchup. * Total phenols mg/100g as gallic acid.
** Total Falvonoids mg/100mg as quraciten.

Table (2) Phenolic compounds in Ketchup treatments mg/100g (On wet weight basis)

Ketchup treatments / Phenolic Components	T_1	T_2	T_3	T_4	T_5
Vanillic	0	0	0	0	19.0250
Caffin	0.636	0	1.188	4.1584	0
Ferulic	1.9105	2.7992	1.8857	0	8.3646
Salycilic	0	0	0	0	85.6218
P. coumaric	0	0	0	0	0
Gallic	0.2213	0.6558	0.2701	0.8644	3.5180
Cinnamic	0.2677	0	0	1.1857	6.5721
Ellagic	1.2353	1.9499	0	3.6189	9.0943
Pyrogallol	12.4139	79.0484	0	95.4879	0
Benzoic	0	0	0	0	0
Chyrisin	0	0.0221	0	0	0

Syringic	0	0	0	0	0
Catechin	0	10.5725	0	11.4659	0
Protocatchoic	0.3152	1.6701	0	0.6087	1.4352
Catechol	0	0.7987	0	0.8119	1.0036
Chlorogenic	4.9023	2.9956	7.2579	0	11.9600
Caffeic	0.1073	0	0.1704	0.4927	1.0031
Total	**19.9919**	**103.5079**	**10.7725**	**118.655**	**128.5727**

T_1 : Tomato ketchup.T_2: Tomato ketchup supplemented with Red Roselle extract.T_3: Tomato ketchup supplemented with tamarind extract.T_4: Red Roselle ketchupT_5: Tamarind ketchup.

Table (3) Flavonoids compounds of Ketchup treatments mg/100g (On wet weight basis)

Ketchup treatments / Flavonoids Components	T_1	T_2	T_3	T_4	T_5
Kamferol	2.9445	1.8832	0.0345	0.2311	0
Hespertin	0	0	0.0618	2.0259	5.4265
Apignen	1.5721	1.0879	0.1268	0	0
Rosmarinic	3.6114	3.6573	0.2648	0.7373	3.9302
Hesperidin	27.1995	0	1.4760	6.5479	85.5110
Rutin	4.4993	3.4781	0.2744	0.5155	0
Quercitrin	5.5172	3.8969	0.1302	0.6905	2.1281
Narenginin	0	0	0	0	0
Querectin	0	6.1009	0.0681	0	1.3550
Total	**45.3739**	**20.1043**	**2.4358**	**10.7482**	**98.3508**

T_1 : Tomato ketchup.T_2: Tomato ketchup supplemented with Red Roselle extract.T_3: Tomato ketchup supplemented with tamarind extract.T_4: Red Roselle ketchupT_5: Tamarind ketchup.

Table (4) Organoleptic Evaluation of Ketchup treatments form 1 to 10

Treatments	Color	Taste	Odor	Texture	Overall acceptability
T_1	9.2^{a}	9.2^{a}	9.1^{a}	9.3^{a}	9.25^{a}
T_2	8.45^{b}	8.6^{b}	8.9^{a}	9.0^{ab}	9.0^{a}
T_3	7.3^{c}	8.5^{b}	7.85^{b}	8.45^{b}	8.3^{b}
T_4	6.2^{d}	6.5^{d}	6.7^{c}	6.4^{c}	6.1^{c}
T_5	5.6^{d}	7.2^{c}	6.85^{c}	7.4^{d}	7.1^{c}
L.S.D. at 0.05	**0.726**	**0.563**	**0.897**	**0.795**	**0.632**

T_1: Tomato ketchup.T_2: Tomato ketchup supplemented with Red Roselle extract.T_3: Tomato ketchup supplemented with tamarind extract.T_4: Red Roselle ketchupT_5: Tamarind ketchup.

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