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THE TRADITIONAL EGYPTIAN BASTERMA
I- QUALITY ATTRIBUTES OF MARKET PRODUT

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SUMMARY

Sixty samples of market basterma belonging to three factory grades were examined for, the organoleptic attributes, freshness, chemically and microbiologically. The accepted attributes were determined and deviations reported in the market samples were described and discussed. The pH., fat oxidation criteria and TVBN all correlate with the findings reported for the organoleptic examination.

The chemical analysis revealed that most of the market product failed to comply with the Egyptian standard specifications, and so is the microbiological findings. A matter which calls for additional trials to improve the product.

INTERODUCTION

The Egyptian basterma is a dry cured, pressed, raw lean meat, coated with some oriental spices, in which 60% of the initial moisture content of the raw beef is released by pressing. The product is characterized by its low moisture and fat content, being spicy and salty in taste. Basterma could be sliced to thin slices with moderate binding. Binding is developed inside the meat piece between the bundles and fibres (Build in binding), through the partial solubilization of myocin during curing and pressing. Coagulation of the solubilized and partially extracted myocin then occur through pressing and the further air drying.

The raw beef in common use, now-a-day in Egypt is the imported deboned Frozen hind quarter meat including; top side, silver side, knuckle and the rump. The production as described by Nouman (1997) starts by medium thawing of the frozen material. The beef is then trimmed; i.e. obvious fat, tendons, nodes, vessels and c.t. are removed. The red lean after denuding is then taillored into pieces according to the nature and direction of the bundles, a longitudinal direction is always preserved. Every meat piece is then stabbed with a knife. The stab is made with a narrow mouth and

a longitudinal widebottom. The dry curing operation comes next. Common salt, sodium nitrite, sugar and in some cases other curing aids and antioxidants are the components of the blend.

The curing operation is done by rubbing every piece of meat with the cure mix, the knife stabs are also filled with mix. The treated meat is then placed in vats made of plastic or stainless steel for one day with some cure mix as an overlay. Next day, the cured meat is washed with fresh water and the excess cure mix is removed from the surface and stabs. The washed, cured meat pieces are then arranged on the lower stage of a metal or wooden press in layers with pieces of linen tissue in between. The arrangement on the press stage is done in a way that the knife stabs are to be closed upon pressing. Pressing is usually practized over night. Some processors now-a-day use stainless steel hydrollic basterma press with time and power controls, some with multiphases pressing power with programme controls. As determinaed in one of the visited plants, a pressing power of 5kg/ cm^2. over a meat block hight of 70cm is reasonable. Small scale producers do use a simple metal or wooden or combined press with a simple hydrollic lefter.

Next morning, the meat is taken out of the press, hanged in open place under shade to allow surface drying. The meat is tested for firmness after a couple of hours, then coated. The coating paste is basically made of garlic, fenugreck flour, water and some oriental spices. The ingridients are made into paste by the help of a mincer and a chopper or an arm model blender. The coat is adhesively applied over the meat surface, hanged to dry then could be dispatched. The product is usually stored by the producers, distributors and selling shops hanged at room temperature. Bieng sold sliced upon request.

Some invistigators had studied the hygienic quality and the nutritional contribution of the product (Youssef et al., 1966, Awad & Youssef, 1973; Elbanna, 1974; Saad, 1976; sedik et al., 1982; Elsherif, 1983; Kotzekidou, 1990 in greece, Edris & Salem, 1990; Mousa et al., 1993 a & b; Tolba, 1994; Tolba et al., 1995).

The objectives in the present study is to define the organoleptic and freshness attributes of the market product beside its nutritional contribution and the microbiological attributs. Deviations from the accepted attributes shall be determined. The posible solutions for such deviations are to be dealt with in a separate work.

MATERIALS AND METHODS

Before the collection of the market basterma samples, fifteen basterma producers were visited, the establishments had been inspected and sorted into three classes; I, II and III. Factory grading was according to the hygiene state, machinary available and the availability or not of any quality

certification as well as any quality assurrance practices.

Twenty intact basterma units were then collected from the market for every factory grade group (Total 60 samples). Transferred to the lab. for further investigation.

A- The Organoleptic attributes:

(Price & Schweigert 1971; Bacus, 1984; Pearson & Tauber, 1984; Koch, 1986 and Varnam & Sutberland, 1995).

The professional parameters looked for in this survey are partially an overviews collected at interviews with workers having long experience with basterma making. But most of the scientific landmarks are collected from the above listed references as related to the European and American cured meats. Also the criteria listed in the Egyptian standard specification no. 1042-1991 were considered.

B- Freshness attributes:

Included; PH value of the product (ISO, 1974), and for the extracted fat the acid value (Kates, 1972; Metcalf, 1979 and Pikul et al., 1983). Peroxide number (A.O.A.C., 1990), Thiobarbituric acid reactive substances (TBA), Malonaldehyde content/gm fat (MD/gm fat) according to (Tarladgis et al., 1960; Pikul et al., 1983, Sinnhuber & Yu, 1958 and Yu et al., 1986). Also the total volatile base nitrogen (TVBN) according to (FAO, 1980) was determined.

C- Nutritional contribution:

Included the determination of: moisture content (ISO 1973 a), total protein (AOAC 1990), fat content (ISO 1973 b) Total carbohydrate (Dubois et al., 1956), sodium chloride (AOAC 1990), ash content (ISO 1978) and nitrite (ISO 1975 a).

D- Microbiological attributes:

The following microbial counts were determined; total aerobic (ISO, 1976), total thermoduric (Harrigan & McCane 1976; and Collins & Lyne, 1984), anaerobes (Brewer & Allgeier, 1966), Staphylococcus aureus (FAO, 1992) and total yeast and mould count (Balley & Scott, 1974). Beside; a test for Salmonellae (ISO, 1975 b and Harvey & Price, 1981) and for enteropathogenic E. coli (ICMSF, 1978).

RESULTS and DISCUSSION

The organoleptic examination of the product included the Coat and the *cured meat* for; *appearance, flavor* and the *technical properties*. The accepted *yellow brown* and the *brown colours* were recorded for 31.6% and 35% of market samples, being more frequent for products of grade I factories than the other II and III grades (Table 1). Deviations were described as *dark brown,blackish* and *artificially* coloured. Moreover; the *intact coat* was only recognized in 55% of the samples. Deviations noted were, the *cracked, cracked &*

detached and the *detached coat*. The accepted *spicy* odour was noted in 78.3% of the coat of examined samples. Deviations were noted as *sour, musty* and *rancid*. The skillfulness of the coat making were evaluated according to the degree of ingredients particle size reduction as *fine* or *coarse*, its addhessiveness to the cured meat surface as *well* or *bad*, the thickness homogenisity as *regular* or *irregular* and its degree of drieness as *regular, inner soft* or *all soft*.

The dark brown and the black brown colours of the coat are indications of a long stored product and/or the direct exposure of the fresh coated basterma to sunlight. On the other hand, cracked or detached coat could be attributed to the unskillful spice paste making or application. Unbalanced water, garlic to fenugreck powder (loose paste). Or coating of the cured meat before sufficient drying and or those with opened knife stabs.
The average coat to the cured meat weight is 18.66%, and 62% of examined samples comply with the E.S.S. 1042-1991 in this aspect.

The sour coat odour is a function of the high microbial load, the musty and rancid note is coming from the meat itself as had been noted from the results of the individual samples during the lab. Work.

The accepted *normal cure* colour of the meat is recognized in 70% of the examined samples. Deviations were; *fading, over cure* and *greening*. The meat was also inspected for its texture and 73.3% were noted as *firm*. The mouth of the *knife stabs* were found *closed* in 58.3%. *opened* and sometimes *mouldy* in the rest. The specific flavour of the cured meat was reported for 75% of the samples. Deviations were noted as sour or putrid. The meat was also inspected for the skillfulness of pressing, knife stab performance, degree of trimming as well or bad. As well as the degree of curing, drieness and binding of the sliced product.

Colour deviations in the cured meat may be physical, chemical or deteriorative in nature. Physical is due to much seeping of the sarcoplasm during thawing of the frozen meat (M.B. 1983) and hence no enough myoglobin remain to react with nitrite (fading). The chemical one is due to the presence of impurities in the common salt (Ruiter, 1995). Impurities include, copper, iron, chromium, chlorides and sulfates of calcium and magnesium. Colour deviations during meat curing may be due to such impurities. Microbial deterioration is another cause for greening in cured meat (Price & Schweigert, 1971; Frazier & Westhoff, 1978).

Table 2, revealed a mean pH value of 5.6 at the outer tissue of the cured meat and 5.4 at the centre. Askar et al. (1993) reported similar values and they observed a reduction in pH by storage of the product (5.56 to 4.88 in two weeks).

The mean acid value for the extracted fat was 2.4

(min. 1.9, max. 3.9)., whereas the peroxide number mean value was 18.3 (min. 16.1, max. 28.1). The TBA value ranged from 0.23 to 1.35 with a mean of 0.53. The calculated malonaldehyde/gm of extracted fat ranged between 46 ug and 215 ug. with a mean of 88.1.

Studying the detailed results of the individual samples, it had been observed that; samples noted as deviated flavour (sour, rancid or putrid) expressed proportionally higher acid value and peroxide number (round 3 and over 20 with malonaldhyde content of 90 ug/gm fat or higher. Such a high value is due to the relative high salt content of basterma, and being prepared at room temperature, salt works as a prooxidant resulting in much malonaldehyde production (Angelo & Bailey, 1987).

The total volatile basic nitrogen varied from 14.6 to 27.3 with a mean value of 18.1. Ten samples out of 60 had higher value than that reproted by the E.S.S. 1042/1991. Such higher values are due to the use of long stored frozen beef. An observation which was nearly equal with the three factory grades.

Table 3, illustrates the nutritional contribution of the market basterma samples. Only one sample could comply with the E.S.S. 1042/1991 as regard the moisture content. For the fat%, it is evident that 73.3% of the samples had higher values. Such high fat content may be due to insufficient trimming or the use of lower grade meat cuts. Also the nitrite content was high in 61.7% of the samples. It is also evident that when the correct meat cut is used and the curing, pressing and drying are perfectly made; the M:P ratio is round 1.8. The mean value of carbohydrate was 1.3% and varied between 0.8% and 2.0% of the cured meat weight. These values could be considered reasonable so far as the initial carbohydrate in raw beef is considered (Lawrie 1991). The common salt and ash content were in accordance with the E.S.S. 1042-1991. But not the nitrite. Despite nitrite is a sole additive in basterma making. Its overdosing does not only harm the health but also results in colour deviations. Nitrite function is that it fixes the red to pink colour commonly observed in cured meat, enhance flavour and most important is the inhibition of toxin production by Cl. Botulinum. The later function is obtained at nitrite level of 50-100 ppm in similar products when ascorbic and sorbic acids coexist (Jay, 1992; Mossel et al., 1995).

Table 4, illustrates the microbiological attributes of the market product. It is observed that the basterma coat and meat are severly contaminated. Evaluating the product under the light of the E.S.S. 1042-1991, it is evident that 55%, 78.3%, 63.3%, 48.3%, 35% and 28.3% of the examined samples are considered rejected concerning the aerobic count of the coat, meat, the anaerobic count , *S. aureus* , mould and yeast counts respectively. Moreover one sample contained sal-

Table (1): Organoleptic Attributes of market Basterma Samples.

Factory grade	Appearance																	Flavor						
	Coat								Meat surface									Odor of Caot				Meat		
	Color					Condition			Color				Condition						Deviated				Deviated	
	Fresh yellow brown	Brown	Deviated			Intact	Deviated		% to total weight	Normal Cure	Deviated			Firm	Soft	Knife stabs			Normal specific	Sour	Musty	Rancid	Normal Cure Flavor	Sour	Putrid
			Drak brown	Blackish brown	Artificial Coloured		Cracked	Detatched			Fading	Over Cure	Greening			Closed	Opened	Mouldy							
I	8	8	3	1	4	13	7	3	17.8	14	2	2	2	17	3	13	7	3	17	1	1	1	17	2	1
II	6	7	6	1	5	11	6	4	18.1	15	3	4	3	15	5	12	8	4	16	2	2	1	15	2	3
III	5	6	8	1	7	9	10	6	20.1	13	2	5	4	12	8	10	10	4	14	2	3	3	13	3	4
Total	19	21	17	3	16	33	23	13		42	7	11	9	44	16	35	25	11	47	5	6	5	45	7	8
%	31.6	35	28.3	5	26.6	55	38.3	21.6		70	11.6	18.3	15	73.3	26.6	58.3	41.6	18.3	78.3	3.8	10	8.3	75	11.6	13.3

Table (1): (Continued)

Factory grade	Technical Properties																						
	Coat									Meat													
										Intact						Slice Condition						
	Particles		Addhessivnes		Thickness		Drieness			Pressing		Knife stabs		Trimming		Curing			Drieness		Binding	
	Fine	Coarse	Well	Bad	Regular	Irregular	Regular	Inner soft	All soft	Well	Under	Well	Bad	Well	Bad	Correct	Over	Fading	Even	Uneven	Well	Bad
I	16	4	17	3	15	5	15	3	2	15	5	15	5	17	3	13	2	5	15	5	16	4
II	15	5	14	6	14	6	13	5	2	15	5	13	7	16	4	12	2	6	15	5	15	5
III	13	7	12	8	12	8	11	5	4	11	9	10	10	12	8	9	6	5	13	7	13	7
Total	44	16	43	17	41	19	39	13	8	41	19	38	22	45	15	34	10	16	43	17	44	16
%	73.3	26.6	71.6	28.3	68.3	31.6	65	21.6	13.3	68.3	31.6	63.3	36.6	75.0	25.0	56.6	16.6	26.6	71.6	28.3	73.3	26.6

monella and 6 samples were positive for E.P.E.C. The isolated salmonella was typed as S. paratyphi a., the E.P.E. coli were; O_{119}:K_{69} (B_{14}), O_{26} (B_6) and O_{157}:H_7.

The achieved microbiological results reflect the bad hygiene state and practice of the majority of producing plants, even graded as I, being very bad in those graded as II and III.

The overall conclusion of this survey could be reviewed as follows:

The organoleptic attributes; the coat is to be inspected for its colour, fresh yellow brown and brown with spicy odour are to be considered accepted. Deviations as dark brown or blakish are indication of old or bad stored product, beside the unnecessary colourants which may mask the quality or cause health risk to consumers. The coat condition vice, intact, cracked, detached and/or mouldy must be looked for. The degree of adhesiveness to meat surface and the thickness regularity, degree and level of dryness are parameters indicative of basterma quality.

The determined accepted colour and odour of the meat are those specific for cured one. Deviations as fading, over cure, greening with sour or putrid odour are indications for deterioration or bad processing. The degree of meat trimming,

Table (2): Freshness Attributes of market basterma smaples

Factory grade	pH value		Fat oxidation criteria					TVBN
	Outer	Core	Acid Value	Peroxide number	Malonaldhyde concentration			
					Fat %	Ug MD/gm Fat	TBA Value	
I	5.6	5.5	2.3	18.0	5.7	84.7	0.48	17.4
II	5.6	5.4	2.4	18.2	6.1	83.5	0.50	17.6
III	5.7	5.3	2.8	18.8	6.8	96.2	0.61	19.5
Total mean	5.6	5.4	2.5	18.3	6.2	88.1	0.53	18.1
Maximum	5.9	5.8	3.9	28.1	11.4	215	1.35	27.3
Minimum	5.2	4.8	1.9	16.1	4.2	46	0.23	14.6

Table (3): Nutritional Contribution of market Basterma Samples

Factory grade	Moisture	Protein	Fat	Carbohydrate	Na Cl	Ash	Moisture protein ratio	Nitrite (p.p.m)
I	55.5	30.1	5.7	1.2	6.2	7.6	1.82	125.1
II	55.7	28.4	6.1	1.5	7.1	8.1	1.96	125.3
III	56.2	27.5	6.8	1.2	7.2	8.1	2.04	129.9
Total mean	55.6	28.6	6.2	1.3	6.8	7.9	1.94	126.7
Maximum	49.5	23.8	4.2	0.8	5.1	6.5	1.46	78
Minimum	64.2	33.7	11.4	2.0	8.0	9.3	2.69	172
No. of Accepted Samples According to E.S.S. 1042-1991	1 (1.7%)	****	16 (26.7%)	***	60 (100%)	****	****	23 (38.3%)
No. of Non Accepted Samples According to E.S.S. 1042-1991	59 (98.3%)	****	44 (73.3%)	***	0 (0%)	****	****	37 (61.7%)

**** Not reported in E.S.S. 1042-1991.

pressing and the condition of the knife stabs are additional criteria to be evaluated during product examination. Also the degree of binding developed in the meat could be tested in the sliced product.

The freshness attributes; a pH. of 5.2 to 5.6 is the range to be accepted. Lower values were noted sour and higher values were noted putrid. The fat oxidation criteria vice, acid value, peroxide number and TBA value are valuable landmarks for fat safety in the product. Beside the TVBN as an indication of meat protein quality.

The nutritional contribution; the product is a reliable source of animal protein. But the risk of degradation of both protein, fat, high salt content and nitrites are alarming.

The microbiological attributes of the product as determined calls for the necessity of improvement and creation of other technologies to make it more better and safe. This shall be tried in the next investigation.

Table (4): Microbiological Attributes of market Basterma Samples.

Factory grade	Microbial counts/gm							Test for	
	Aerobic count		Anaerobic	Staph. aureus	Enterobact-eriaceae	Mould	Yeast	Salmonellae	E.P.E.C.
	Coat	Meat							
I	$3x10^6$	$8.2x10^4$	$8x10^2$	$3.8x10^2$	$7.3x10^2$	$8.1x10^2$	$1.5x10^2$	0	1
II	$1.5x10^7$	$3.8x10^5$	$2.4x10^3$	$3.8x10^2$	$5.2x10^3$	$1.9x10^3$	$5.8x10^2$	0	2
III	$3.6x10^7$	$4.7x10^6$	$2.5x10^3$	$5.8x10^2$	$6.9x10^3$	$2.6x10^3$	$6.1x10^2$	1	3
Total mean	$1.7x10^7$	$1.7x10^6$	$1.9x10^3$	$5.3x10^2$	$4.2x10^3$	$1.7x10^3$	$4.4x10^2$		
Maximum	$2x10^8$	$3x10^7$	$1x10^4$	$3x10^3$	$3x10^4$	$9x10^3$	$3x10^3$		
Minimum	$2x10^4$	$1x10^3$	$<10^2$	$<10^2$	$<10^2$	$<10^2$	$<10^2$		
No. of Accepted Samples According to E.S.S. 1042-1991	27 (45%)	13 (21.7%)	22 (36.7%)	31 (51.7%)	***	39 (65%)	43 (71.7%)	59 (98.3%)	54 (90%)
No. of Non Accepted Samples According to the E.S.S. 1042-1991	33 (55%)	47 (78.3%)	38 (63.3%)	29 (48.3%)	***	11 (35%)	17 (28.3%)	1 (1.7%)	6 (10%)

**** Not reported in E.S.S. 1042-1991.
E.P.E.C. Enteropathogenic Echerichia coli

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