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IMPROVEMENT OF SAUSAGE COLOR BY ADDITION OF RED BEET JUICE

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INTRODUCTION

Sodium nitrite has been used for a long time in processing sausages and cured meats for its anticlosridial affect and the desirable characteristisic of color and flavor; improved by such compound (Sokoloy ,1965). Due to the toxic effect of nitrite and its possible reaction with amines to form the carcinogenic nitrosamines; the nutritional law restricted its addition to 200 mg/kg (200 ppm) by the Egyptian Food Standards (1966) and was reduced to 125 mg/kg (FAO/WHO,1976). Wasserman et al.(1977) stated that flavor could be produced without the addition of nitrite. Fvanska (1976) reported that red beet juice could be used instead of nitrite during salting meat sausage in brine. She added that to avoid surface coloration of meat without development of the red color in the central part, salting should be carried out at above 20°C to enhance the meat autolysis.

This work was carried out to study the affect of addition of red beet juice in avoiding the discoloration of the central parts of sausage, also to find out means for reducing or eliminating the added nitrite during production of ground meat sausage.

carried out according to the method of Molander (1960).

RESULTS AND DISCUSSION

Results in Table (1) showed that the residual nitrite was reduced during storage. Whereas no addition of nitrite + nitrite ; the sausage was found to contain 16 ppm of nitirte (Treatment 5). This was explained by Askar et al. (1981) who pointed out that salt and or spices may contain quite enough amounts of nitrite and nitrate as admixtures. On the other hand, the color intensity of such treatment retained 81% of the color recorded for the control sample (treatment 1) which may be due to the affect of beet juice; consequently the addition of nitrite and nitrate could be avoided entirely without affecting the color of sauage. Subsequently; flavor and taste were not affected, being very full taste and pronounced aroma for treatment 1 & 5 (Table 2). The total valatile nitrogen and ammonia constituents were not markedly influenced by the addition of beet juice; which may be attributed to the bactercidal effect of beet juice.

These findings were in agreement with those reported by Evanska (1967). Neverthelss, total volatite nitrogen (T.V.N.) and ammonia were slightly higher for treatment (5) then in treatment(1). Very slight differences were also found between treatments when the total viable count and TBA value were considered (Table 1). During the storage peirod, progressive decrease in residual nitrite was recorded in all treatments. This might be attributed to the action of microorganisms which break down nitrate and nitrite to nitric oxide which reacts with myglobin to form nitrosomyglobin as reported by Sokolov (1965). During storage; the higher the initial dose of nitric and nitrate, the higher the residual nitrite was found. Sausages containing beet juice only (treatment 5) were nearly free of residual nitrite (7 ppm nitrite only)after twenty days and completely free after 30 days of storage. On the other hand, the storage period from 10-20 days at 4°C, did not affect markedly the T.V.N., ammonia and TBA values; although it seems to be slightly higher in sausages containing beet juice only. This indicated that beet juice did not cause considerable acceleration for protein breakdown or lipid oxidation. These results showed that beet juice could be added in a ratio of 20% (on the expense of adding water) in sausage content without adding nitrite or nitrate and without affecting the keeping quality of sausages.

MATERIAL AND METHODS

The sausage (ground type) was prepared as described by Manerberger and Bortkevitch(1973). Lean meat from hind quarters of buffalo male (about 2 years old) was used. Fats from the same carcass were also used in the sausage mixture. The sausage mixture composed of lean meat , fats, spices and parsley were grounded together and mixed with water or red beet juice. The mixture was thereafter stuffed into natural mutton casings. The following recipe of sausage was conducted :

	%		%
Lean meat	57.50	black pepper	0.45
Fat tissues	17.83	Gubeb	0.22
Salt (NaCl)	2.67	Red Pepper	0.22
Ascrbic acid	0.22	Parsley	0.89
Water or red beet juice 20%			

In case of using red beet juice; no water was added. Sodium nitrite, sodium nitrate, water and beet juice were added in percentages as follows :-

- Sodium nitrite (gm/100 gm). 0.025, 0.020, 0.015, and 0.010.
- Sodium nitrite (gm/100 gm). 0.250, 0.200, 0.150, and 0.100
- Water 20.000 , - , - , - , -
- Beet Juice - , 20.000, 20,000, 20,000, and 20.000.

Sausages were analyzed after 24 hrs. of preparation and storage at 4°C. (settling for development of red color): then after 10,20, and 30 days storage.

Analytical method :

Nitrite was determined according to the method reported by Gran and Mirna (1957). Color intensity was measured at 412 µm as described by Husaini et al., (1950). The total volatile nitrogen (T.V.N.) and ammonia were estimated using the method described by Winton and Winton(1958).

Thiobarbituric acid value (TBA) was determined using the method applied by Pearson (1970). Results were recorded as malonaldehyde mg/kg. Total viable counts were made according to the method of Frazier and Foster; (1950). Sensory evaluation of color, aroma, and taste of cooked sausage were

Table (1) : Chemical and microbiological characteristics of buffalo sausage during storage.

Storage (days) at 4°C.	Treatment	Components					
		Nitrite ppm.	Color intenesity	T.V.N. (mg/100g)	Ammonia (mg/100g)	TBA/ value	Total viable count X 10^4
Zero time	1	120	1.05	12.36	6.15	1.20	0.47
	2	89	0.95	13.46	6.75	1.30	0.50
	3	80	0.90	14.35	7.38	1.35	0.52
	4	65	0.90	14.83	8.05	1.35	0.53
	5	16	0.85	15.75	7.56	1.45	0.55
10	1	100	0.98	15.7	8.32	2.18	0.76
	2	75	0.85	18.12	8.53	2.79	0.99
	3	66	0.82	18.01	9.04	3.24	1.65
	4	54	0.82	19.58	9.16	3.51	1.91
	5	11	0.89	20.43	10.52	3.75	1.72
20	1	81	0.86	19.15	10.58	3.34	2.01
	2	65	0.79	23.62	11.15	3.87	2.36
	3	52	0.75	24.34	11.33	4.36	3.03
	4	43	0.73	24.89	11.89	10.74	4.64
	5	7	0.70	25.51	12.04	4.96	5.29
30 (spoilage)	1	62	0.72	33.01	18.37	5.61	101.50
	2	57	0.61	37.20	20.15	5.71	104.50
	3	48	0.53	41.25	21.11	5.95	111.60
	4	32	0.50	42.15	21.06	5.95	125.90
	5	0.0	0.48	43.15	23.31	6.00	137.00

Treatments : 1. 0.025% $NaNO_2$ + 0.25 % $NaNO_3$
2. 0.02 % " + 0.20 % " + 20% beet juice
3. 0.15 % " + 0.15 % " + " " "
4. 0.010% " + 0.10 % " + " " "
5. 20 % beet juice.

Table 2 : Organoleptic scores of cooked baffalo sausages during storage at 4°C.

Storage at 4°C (days)	Zero Time					10 days					* 20 days					30 days				
* Treatments	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
Colour	9	8	8	8	8	9	7	7	7	7	8	7	7	7	7	4	3	3	3	3
Aroma	9	8	8	8	8	8	7	7	7	7	8	7	7	7	7	2	1	1	1	1
Taste	9	8	8	8	8	8	7	7	7	7	8	8	7	7	7	-	-	-	-	-

* Treatments : (1) 0.025% $NaNO_2$ + 0.25 % $NaNO_3$
(2) 0.020% $NaNO_2$ + 0.20% $NaNO_3$ + 20 % beet juice
(3) 0.015% $NaNO_2$ + 0.15% $NaNO_3$ + 20 % beet juice
(4) 0.10% $NaNO_2$ + 0.10% $NaNO_2$ + 20 % beet juice
(5) 20% beet juice.

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