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Pakistan J. Sci. Ind. Res., Vol. 30, No. 7, July 1987

COPPER, LEAD, TIN AND ZINC CONTENTS IN CANNED AND BOTTLED FRUIT AND FRUIT PRODUCTS

F.A. Siddique*, Salah-ud-Din, B.A. Mahmood and F.H. Shah

Food Technology and Fermentation Division, PCSIR Laboratories, Lahore-16

(Received April 10, 1986; revised June 22, 1987)

Copper, lead, tin and zinc contents of canned and bottled foods were determined. Maximum levels of Cu, Pb, Sn and Zn in fruit and fruit products were 3.62, 9.67, 56.25 and 50.15 ppm respectively. These levels were comparitively less in products packed in glass jars than those in tin containers.

Key words: Trace element, Heavy metals, Fruit products.

INTRODUCTION

The determination of trace elements in canned food has assumed importance in recent years [1-3]. Depending on the conditions, canned food may provide a significant addition of copper, lead, tin and zinc to the diet as a result of corrosion of the container by its elements [4-7]. The exact determination of traces of metals is necessary in quality control of canned food and for food safety.

In Pakistan, there is a growing tendency to use canning as a method of preservation and packing. Although most of these canned items are exported, yet a small percentage is consumed in the country as well. The primary objective of this study is to assess copper, lead, tin and zinc contents of canned and bottled foods.

MATERIAL AND METHODS

Materials. Freshly packed fruit products in the form of jams (apple, mango, plum, mixed fruits), jelly (apple), marmalade, fruit halves (pear and peach) and fruit salad were purchased from the local market. The content of each can was macerated prior to subsampling. These were kept at ambient temperature which ranged from 18 to 30°

Methods. Food samples (50 g) were wet – digested [8] and analyzed by atomic absorption spectrophotometry (Hitachi 170/10 flame stomic absorption spectrophotometer) for copper, lead and zinc contents. Ammonium pyrrolidine dithio-carbamate (APDC) was used as a chelating agent, and the complex was extracted with methyl isobutyl ketone (MIBK) for the final determination.

*Botany Department, University of the Punjab, Lahore, Pakistan.

The colorimetric method of Krik and Pocklington [9] was adopted for the determination of tin.

pH of the macerated product was recorded with a pH meter (Model EIL 7045/46).

RESULTS AND DISCUSSION

The concentration of copper in canned and bottled fruit products is summarized in Table 1. Copper content was maximum (3.62 ppm) in mixed fruit samples and minimum (1.07 ppm) in pear halves. The jam packed in tin containers and that packed in glass jars showed small variation in copper content. The copper level in all fruit products was below the maximum permissible limit, i.e., 50 ppm for canned fruit and vegetables [10].

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Table 1. Characteristics of canned and bottled fruit

products

	С	anned produc	Bottled products			
Fruit products	No. of samples	Can type*	pH	No. of samples	рН	
Apple jam	w es 3 bec	in content is car 1 rod fe	3.5	it to 4one	3.6	
Apple jelly	3	onessLat ()	3.8	4	3.7	
Mango jam	3	L	3.4	4	3.5	
Plum jam	3	L	3.5	4	3.4	
Mixed fruit jam	3	Dalao Los on	4.0	4 4	4.1	
Marmalade	3	.mgq L 0.001	3.5	notì 4 tim	3.3.	
Pear halves	3	lie v Leon J	3.2	onta ation	teine	
Peach halves	3	s bor L barr	3.4	mor l aso	no+hoi	
Fruit salad	3	L .0000	3.3	a manno	tiv n e er	

*Can type: L. lacquered.

Fruit	Copper (ppm)		Pb (ppm)		Sn (ppm)		Zn (ppm)	
products	Can container	Glass jar	Can container	Glass jar	Can container	Glass jar	Can container	Glass jar
Apple jam	2.37(±0.53)	2.17(±0.23)	7.50(±1.29)	3.25(±0.60)	46.70(±2.21)	4.5(±0.90)	18.25(±2.75)	1.20(±0.20)
Apple jelly	2.85(±0.67)	2.07(±0.10)	9.67(±0.69)	4.50(±1.18)	52.75(±4.76)	3.9(±0.78)	17.50(±3.41)	0.70(±0.15)
Mango jam	1.57(±0.75)	1.20(±0.21)	9.25(±2.21)	4.15(±0.97)	56.25(±2.21)	1.8(±0.16)	14.25(±0.47)	0.85(±0.20)
Plum jam	1.62(±0.53)	1.47(±0.25)	9.25(±2.20)	4.75(±1.47)	48.87(±2.21)	1.5(±0.30)	16.05(±2.36)	0.30(±0.10)
Mixed fruit jam	3.62(±1.83)	3.40(±0.33)	8.50(±1.29)	3.50(±1.20)	45.60(±2.16)	3.3(±0.50)	20.57(±1.37)	1.80(±0.35)
Marmalade	2.60(±0.81)	2.30(±0.15)	9.50(±2.00)	4.25(±1.52)	27.75(±3.80)	2.9(±0.30)	31.00(±2.71)	0.65(±0.22)
Pear halves	1.07(±0.17)	Datterna and	8.70(±1.50)	HOLE DOLLE	48.50(±1.82)	and then more	32.11(±0.62)	_
Peach halves	1.25(±0.36)	ld ci nc par	7.70(±0.31)	are arew store	31.92(±1.55)	911 M BA M	38.72(±0.98)	
Fruit salad	1.17(±0.30)	mos <u>m</u> i ni se	7.50(±1.29)	ts pae <u>k</u> ed in gi Foot eoolue	61.87(±1.75)	com <u>p</u> aritive. Frana alaman	50.15(±0.62)	-

Table 2. Copper, lead, tin and zinc contents of fruit products*

*Each value represents the average of triplicate determinations in the contents of separate cans.

The lead contents of various fruit products packed in tin cans ranged between 7.50 to 9.67 ppm (Table 2). Higher level of lead was observed in the case of apple jelly (9.67 ppm) and marmalade (9.50 ppm) as compared to pear halves (8.70 ppm), peach halves (7.70 ppm) and fruit salad (7.50 ppm). Levels of lead in fruit products packed in glass jars were lower than those in tin cans. The concentrations of lead in all these products were higher than the maximum permissible limit (3.0 ppm) of lead [11]. The lead levels reported here are in agreement with those reported in the literature [12]. Lead may enter the products during processing and due to the addition of various chemicals, but cans appear to be the main source of contamination in canned fruits. High lead contents of canned fruits, though undesirable, yet they do not pose any real threat to be general public health because of the relatively small proportions of such foods being injected by a common man in Pakistan.

There is a great variation in the tin contents of various fruit products as reported in the Table 2. Fruit salad packed in tin cans contained the highest amount of tin (61.87 ppm), while marmalade contained the lowest tin contents (27.75 ppm). Products preserved in glass jars had much lower tin (1.50-4.50 ppm) content than canned samples. The presence of tin in the canned food was well within the recommended FAO/WHO tolerance limits (250.0 ppm) [15]. These results are in agreement with those reported by Peattie *et al.* [14] who reported the presence of tin in canned fruits from 10.0-100.0 ppm. The low tin content in bottled fruits shows that nearly all the tin in the canned food comes from the canned food and contamination from the environment is minimum.

Zinc content of the canned fruits varies widely, ranging

from 14.25 ppm in mango jam to 50.15 ppm in fruit salad. From these results, it can be seen that canned fruits were higher in zinc levels than those packed in bottles (0.30-1.80 ppm), but were within acceptable limits of 50 ppm Zn. Similar results have been reported [15] for bottled and canned fruits.

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NULKODUCTION

An internate in the keeping product for the table during alorage and/or true off-anon can be achieved by producing only of higher hygicale quality at the fant woring and manopering at lower comparature or theoreization - a sub preservicization heat treatment - of the milk on arrival at the dairy. The underirability of adding preservatives soon after cooling at the farm would diminish if an invoconous preservative such as CO, could be used [6].

Most of the earlier work with respect to actop incumzation of CO₂ treatments centred on the offect of inch treatments on the keeping quality of cold milk However, atoring tails at low temperature (avours the growth of gsychrictophic organisms Speak and Adams [10] and Cogan [4], reported that the lipuse and proteiners enzymes produced during the cold storage of mdk may give the to produced during the cold storage of mdk may give the to arritk. So it could be install to preven psychrotropic from milk. So it could be install to preven psychrotropic from and Gilmour et al. [5] mentioned that thermization gives the measure of control psychrotropic from 10^{-1}_{-1} [4], Mabhatt [6]. King and Mabhatt [6] and Ratio gives the spiratement cold storage. (b) the other hand, Coll and Tau measure of control psychrotropic is and fau and Gilmour et al. [5] mentioned that thermization gives a spiratement cold storage. (b) the other hand, Coll and Tau (9) reported that milk can be chemically its and Ratio defined to control such bacteria and to increase the kruping quality to control such bacteria and to increase the kruping quality.

The purpose of this study was to provide some prefimany data on the effect of thermitation and CO₂ (realments an the electrophysical properties of mill proteins during cold sturger

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Fresh cose is unit, was obtained from the herd of Freulty of Agriculture, Kair El-Sheikh. The rolk was stammed and the flist portion was immediately thermized ($\delta \delta^{O}/2$ min.) and then cooled, CO₂ treatments were carried out as described by Kashed et al. [9] to give a calculated CO₂ contents of 5/0, 2/5 and 35/0 g C($_{12}$ ⁽¹⁾ of milk. The treated and untreated fulls seciple? For stored in a refigerator (δ^{-1} 1°) for 96 hr, are supplied when fresh und after 24, 48, 72 and 96 hr for gropating actd caselin ard whey.

Isoelectrically precipitated whole casein was proposed according to the method of Mokenzie [7], whereas they was docanted from the precipitated casein and thereal through Wantman. No. 40 filter paper Samples for electrophereds ware prepared by addirig sperose to whey to give a final manetization of the whoreas fusein was distribute to the 16M). Softher equal IF was used as a tracking for

The methods of Davies [3] was followed for heating whey proteins with the exception first fixation and staining were corried our using T.C. A. (15–7.) and Coomassie Blue R. 250 solution (0.1.2. g dye in a 100 ml mixture of giaztid metric acid, methanol and distribed water, 1.5.4 in order). Destabiling solution was prepared by mixing methanol (250 ml) glyzetol (100 ml), giactid aceric acid (75 ml) ind water (4.20 ml). Costing comin samples was achieved using acrytamide get (7.9.) which was prepared by mixing using acrytamide get (7.9.) which was prepared by mixing using acrytamide get (7.9.) which was prepared by mixing using acrytamide get (7.9.) which was prepared by mixing in distribute was dissolved use a and 10 ml of stock buffer. The mixture was dissolved in distribed water and made to a volume of 100 ml. Tr.MED