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Original Article

QUANTITATIVE ESTIMATION OF MAGNESIUM CARBONATE IN PAN MASALA AND GUTKA

PANDEY PRIYAMBADA[1*], GOYAL ANJU[2]

[1]M. Pharma Research Scholar (Pharmaceutical Quality Assurance), B. N. University, Udaipur (Raj), [2]HOD, Department of Pharmaceutical Quality Assurance, B. N. University, Udaipur (Raj)
Email: priyambadapandey93@gmail.com

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ABSTRACT

Objective: The objective of present study is to detect and quantitatively estimate Magnesium Carbonate, a potential carcinogen used for its anti-caking property in various brands of Pan Masala and Gutka by the simple, economic and effective method.

Methods: The water-soluble extract of various brands of Pan Masala and Gutka was prepared by a wrist action rotary shaker for 60 min. The extract was filtered, and the filtrate was titrated against 0.1N EDTA using Eriochrome Black T indicator at pH 10 and using Murexide indicator at pH 12.

Results: The presence of Magnesium Carbonate was found to be less than 2% in all brands of Pan Masala and less than 3% in all brands of Gutka samples used in the analysis.

Conclusion: There is Magnesium Carbonate used in all brands of Pan Masala and Gutka used in the present study.

Keywords: Carcinogenic, Magnesium Carbonate, Water soluble extract, EDTA, Pan Masala, Gutka etc

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INTRODUCTION

The consumption of areca in many forms such as pan masala (PM), betel quid, gutka, etc., has become a part of the lifestyle in many rural and urban areas [1]. Both Pan masala and Gutka are a form of smokeless tobacco products. The term "smokeless tobacco" means consumption of unburned tobacco, in the form of chewing, spitting, dipping, and snuff. Tobacco containing pan Masalas are called Gutka [2]. These products are consumed for mouth-freshening, aid in digestion, germ-killing, astringency, mood enhancement, tension relief, and oral cleaning as claimed by the producers of Pan Masala and Gutka. The pleasant taste and sweetness of these products aggregate microbes, causing damage to teeth [3]. Misleading advertisements, cheap price and easy availability in bright pouches is the main center of attraction [4]. The emergence of commercial pan masala and Gutka about three decades ago has made its deep root in Indian market with massive growth in the sales of smokeless tobacco and areca nut products. The trade of pan masala and Gutka or other smokeless products is not limited to Indian Territory but has its roots in foreign countries too due to the migration of people from south Asia [5]. The use of Pan Masala leads to various fatal conditions and affects different parts of the body. Researches done on them have found it fatal for GI system, Cardiac functions, Genito-urinary system and may more [6]. Gutka and Pan Masala, promoted as mouth fresheners, are combination of 4,000 chemicals of which at least 40 are carcinogenic compounds and among these 40 chemicals, the one which is used as an anti-caking agent is Magnesium Carbonate, which is a potential carcinogen [7]. Magnesium carbonate is added to increase the shelf life of the product. Magnesium Carbonate is used in Pan Masala and gutka preparation due to soothing action in the throat and to make Gutka powder homogeneous with tobacco, katha, supari. The worst is that no chronic side effects of the compound are known because there are not enough medical studies [8, 9].

Fig. 1: Pan Masala and gutka [1]

MATERIALS AND METHODS

Chemicals

The samples of different brands of Pan Masala and Gutka were purchased from a retail shop.

All other chemicals and reagents of Analytical Grade used in the analysis were provided by the B. N Institute of Pharmaceutical Sciences for completion of the work.

Physico-chemical evaluation of pan masala and gutka

The physicochemical evaluation was done before beginning a further test of estimating Magnesium Carbonate in Pan Masala and Gutka. The physical evaluation results of Pan Masala and Gutka are shown below in the table.

Table 1: Physico-chemical evaluation of pan masala and gutka

Colour	Light Brown to dark brown
Odour	Pungent smell masked with different fragrance
State	Crystalline Powder
Taste	Sweet producing soothing effect

Preparation and standardization of 0.1M EDTA

Preparation

Dissolve 37.2 gm of EDTA insufficient water and makep the volume up to 1000 ml with distilled water.

Standardisation

Weigh accurately about 0.8 gm of granulated zinc dissolve by gentle warming in 12 ml of dilute hydrochloric acid and 0.1 ml of bromine water. Boil to remove excess bromine, cool and add sufficient water to produce 200.0 ml. Pipette 20.0 ml of the resulting solution into a flask and nearly neutralize with 2M sodium hydroxide.

Dilute to about 150 ml water, add sufficient ammonia buffer pH 10.0 to dissolve the precipitate and add 5 ml in excess. Add 50 mg of Eriochrom Black T indicator and titrate with disodium edetate solution until the solution turns green. Each ml of 0.05M EDTA is equivalent to 0.000654g of Zn [10, 11].

Table 2: Standardisation of 0.1N EDTA solution

S. No.	Volume of 0.1N zinc solution (ml)	Volume of EDTA consumed (ml)			Average
		Initial	Final	Difference	
1.	20	0	14.5	14.5	**16**
2.	20	14.5	30.5	16	
3.	20	30.5	46.5	16	

Calculation of normality of EDTA

Normality of EDTA used = (Normality of Zinc × Volume of Zinc)/Volume of EDTA used

= (0.1 × 20)/16

= 0.125 N

Preparation of samples for analysis [12]

1. The Pan Masala and Gutka samples were grounded and extracted with 50 ml of double distilled water on a wrist action rotary shaker for 60 min.

2. The extract was then filtered. Colour was removed by adding Aluminium Hydroxide solution.

3. To the extract, 1 ml of ammonia buffer and Eriochrome Black T indicator was added. In alkaline conditions, EDTA reacts with Ca and Mg ions to form a soluble chelated complex. Ca and Mg ions develops wine red colour with the indicator under alkaline condition. When EDTA is added as a titrant Ca and Mg ions get complexed resulting in a sharp colour change from wine red to blue, which indicates the end point of the reaction. The pH for this reaction was maintained at pH10.0. Burette reading was recorded as Total Ca+Mg (x ml)

4. To the extract, two ml of 2N NaOH and Murexide indicator was added. At higher pH i.e. about 12.0 magnesium ion precipitates and only calcium ions remain in the solution. At this pH Murexide Indicator forms a pink colour with calcium ion. When EDTA is added calcium gets complexed resulting in a colour change from pink to the purple indicating endpoint. Burette reading was recorded as Total Ca (y ml)

5. $MgCO_3$ content in the solution was found out by subtracting calcium concentration from a total of calcium and magnesium (x–y ml) and using the following equivalency:

1 ml (0.1M) EDTA = 2.432 mg of Mg

RESULTS AND DISCUSSION

The results obtained for quantitative estimation of Magnesium Carbonate in Indian Pan Masala and Gutka are shown in separate tables (table 3 and table 4). From the experiment, it is observed that there is presence of Magnesium Carbonate in both Pan Masala and Gutka. Although the results are below 2% for Pan Masala and below 3% for Gutka, the potential of it being harmful cannot be denied. The Food and Safety Act and rules therein do not mention the use of Magnesium Carbonate in Pan Masala and Gutka still studies have shown that there is presence of Magnesium Carbonate in them [13].

Table 3: Percentage of magnesium carbonate in pan masala

Sample No	Volume of EDTA consumed in ml ($CaCO_3$+$MgCO_3$)	Volume of EDTA consumed in ml ($CaCO_3$)	Volume of EDTA consumed in ml ($MgCO_3$)	Wt of Magnesium Carbonate in mg	Percentage of $MgCO_3$ in one sachet
A	40	12.5	27.5	66.88	1.34%
B	42	11.5	30.5	74.17	1.48%
C	39	13	26	63.23	1.26%
D	43	12.5	30.50	74.17	1.48%

Table 4: Percentage of magnesium carbonate in gutka

Sample No	Volume of EDTA consumed in ml ($CaCO_3$+$MgCO_3$)	Volume of EDTA consumed in ml ($CaCO_3$)	Volume of EDTA consumed in ml ($MgCO_3$)	Wt of Magnesium Carbonate in mg	Percentage of $MgCO_3$ in one sachet
A	48	14.5	33.5	81.47	2.72
B	16	13	33	80.26	2.68

CONCLUSION

The people habituated of having Pan Masala or Gutka in their mouth almost every time are prone to Oral cancer. The ingredients of Pan Masala are already known for their carcinogenicity and addition of Magnesium carbonate to this deteriorates the condition. It acts like fuel to the burning fire. Thus, the presence of Magnesium Carbonate in such minimum quantities is also dangerous. The manufacturers of these items claim that the availability of magnesium carbonates in the Pan Masala and Gutka is unintentional and it is the result of chemical reaction of the products being used in the making of Pan Masala and Gutka.

AUTHORS CONTRIBUTIONS

All the author have contributed equally

CONFLICT OF INTERESTS

Declared none

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