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Ash Analysis in Crime Investigation

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SUÇ ARAŞTIRMALARINDA KÜL ANALİZİ

Özet

Sigara, puro, *beedi* izmarit ve külleri ırza geçme, gasp, hırsızlık gibi birçok kriminal olayda değerli bir kanıt oluşturmaktadır. Bu tür kalıntıların yadli açıdan incelenmesi son derece önemlidir.

Hindistan'ın farklı bölgelerinde üretilen 8 değişik *beedi* örneğinin küllerinde plazma atomik emisyon spektrometresiyle, krom, kobalt, bakır ve çinko elementlerinin düzeyleri ı saptanmıştır.

Elde edilen bulgulardan, elementler gözönüne alındığında anlamlı farklılıklar görülmüştür. Bu farklılıklardan yararlanarak olay yerinde bulunan küllerden marka belirleme sözkonusu olabilmektedir.

Summary

Cigarette, beedi, cigar stubs are invariably associated with crime involving murder, rape, dacoity, burgalary, etc. Its identification and comparison are vital in criminal investigation. Presently eight brands of beedi ash is analysed with the help of the inductively coupled plasma atomic emission spectrometry to know the variation of chromium, cobalt, copper and zinc. The results showed a good deal of variation which can be used in determining the brands of beedi stubs available at the crime scene.

Key words: *Ash - Beedi brands - Forensic science*

INTRODUCTION

In forensic investigation cigarette and beedi stubs has been considered as a good physical evidence in analysing various criminal cases like rape, dacoity, murder, burgalary etc. In order to identify the criminals it is essential to take full advantage of these physical evidences including cigarette and beedi butts available at the crime scene. The identification of the brand of cigarette and beedies becomes an extremely difficult job when the identification marks are burnt. Sometimes the criminal may act intelligently by not leaving the cigarette/beedi butts at crime scene. However, when the cigarette and beedies are smoked the ash may fall on the floor or in the ash tray which can be used fruitfully as the physical evidence. In such instances the forensic scientist has to set to work on the unburnt tobacco and/or the cigarette and beedi ash available at the crime scene.

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As far as the authors are aware there is no information available on elemental analysis of cigarette and beedies ash which can help in their identification. Our earlier studies on tobacco cultivars grown under similar environmental conditions showed a good deal of variation not only in accumulation of certain elements in leaves of different cultivars (1) but also in micromorphological characters of the tobacco leaves (2-4). Therefore presently an attempt has been made to identify eight brands of beedies to see the variation of the chromium, cobalt, copper and zinc contents in the ash.

MATERIAL and METHODS

Eight brands of beedies namely Amrutam, Bikky, Gowner, Kajah, Policemen, Prakash, Shikari and 45 were procured from five different places. Three grams of each brand of beedi were ashed at temperature 800°C. 100 mg ash was dissolved in 50 ml of con. HCl and water (1:4). Inductively coupled plasma atomic emission spectrometry was used for the analysis of Chromium, Cobalt, Copper, and Zinc. The operation parameters of the instrument are followed as per *Bhatia* et *al* (1).

RESULTS and DISCUSSION

The analysis of the four elements viz., Chromium, Cobalt, Copper and Zinc showed a good deal of variation from one beedi brand to the other (Table I; Fig. 1). The Chromium concentration in different brands of beedies varied from 0.0817 ppm as in Gowner to 0.1108 ppm as in Prakash. The Chromium content is more or less similar in Bikky, Kajah and Shikari, 45, while the Cobalt content varied from 0.0129 ppm as in Kajah to 0.0246 ppm in Prakash. Contrary to the Chromium and Cobalt, the Copper and Zinc showed the highest concentrations (Table I). Concentration of Copper varied from 0.3303 ppm as in brand 45 to 0.6157 ppm in Prakash, while the Zinc varied from 0.5015 ppm as in Policemen to 0.8388 ppm in Bikky.

Table I. Concentration of elements in different brands of beedies (ppm).

Name of the beedies	Source	Chromium	Cobalt	Copper	Zinc
1. Amrutam	HY	0.0988	0.0143	0.5041	0.6278
2. Bikky	HY	0.0907	0.0158	0.4211	0.8388
3. Gowner	MA	0.0817	0.0180	0.4531	0.5113
4. Kajah	MA	0.0923	0.0129	0.5020	0.5294
5. Policemen	KU	0.0951	0.0231	0.3677	0.5015
6. Prakash	BO	0.1108	0.0246	0.6157	0.6319
7. Shikari	AN	0.0936	0.0179	0.3488	0.5159
8. 45	KU	0.0925	0.0137	0.3303	0.5184

AN, Anand; BO, Bombay; HY, Hyderabad; KU, Kurukshetra; MA, Madras.

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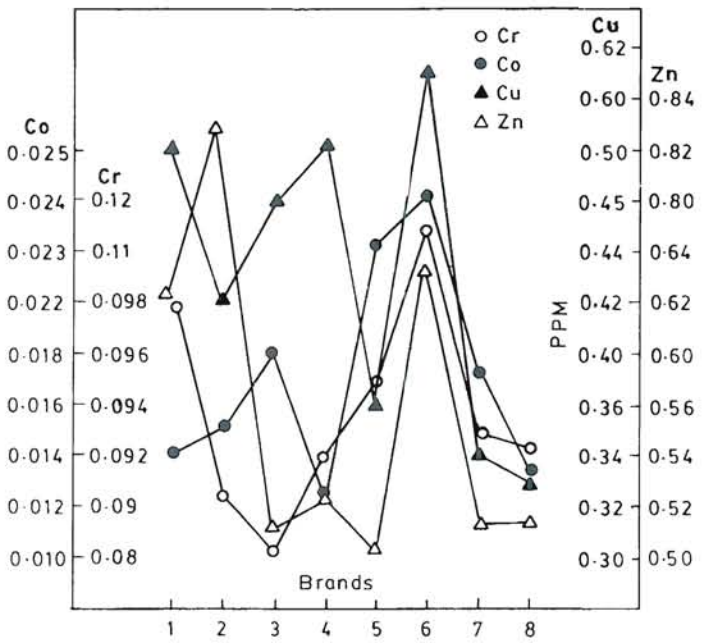

Figure I. Chromium, cobalt, copper and zinc contents in eight brands of beedies.

The colour and flavour of tobacco (5) besides various chemical constituents like alkaloids, nitrogenous compounds, polyphenols, carbonyls, sugars, proteins, volatile oils, wax and lipids, inorganic salts (6-13) were found to be variable from one cultivar of the tobacco to the other. Further it was observed that different cultivars of the tobacco showed differential accumulation of certain elements (1,14) and the accumulation of these elements and other organic compounds mentioned above are genetically controlled (15-17). Leaves of each tobacco cultivar has its characteristic flavour which depends on all the above chemical constituents (10-12). It is a well known fact that different brands of beedies taste differently. Probably these are prepared using different tobacco cultivar leaves. Keeping in view the above, the authors are of the opinion that the information on the variability of elements in different brands of beedies has special significance in forensic science when the cigarette or beedi stubs are burnt to the extent that the label is also burnt or when only ash in the tray or in the floor of crime scene is available.

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REFERENCES

1 Bhatia, R.Y.P., Prabhakar, M., Rao, T.S., Raghunath, K. (1988) *Indian J. Forensic Sci.*, **2**, 145-156.
2 Prabhakar, M., Rao, T.S., Bhatia, R.Y.P. (1988) *Indian J. Forensic Sci.*, **2**, 67-78.
3 Bhatia, R.Y.P., Prabhakar, M., Rao, T.S., (1988) *J. Indian. Acad. Forensic Sci..*, **27**, 1-11.
4 Rao, T.S. (1990) *Morpho-chemical studies on tobacco and its products in relation to Forensic Science*, Ph. D. Thesis. Osmania University, Hyderabad, India.
5 Dahia, M.S., Mukharya, D., Jain, G.C., Jatar, D.P. (1982) Indian J. Criminol. Criminalistics, II, 36-38.
6 Sastry, A.S., Ramakrishna Kurup, C.K. (1958) *J. Sci. Ind. Res.*, **17b**, 499-504.
7 Ramakrishanayya, B.V., Gopalachari, N.C., Murthy, K.S.N. (1966) *Indian J. Appl. Chem.*, **29**, 170-180.
8 Hsieh, R.H. (1973) *Taiwan Agric. Quarterly*, **9**, 187-195.
9 Sabir, S.S. (1976) *Iraq Chem. Soc. J.*, **1**, 81-86.
10 Davis, D.L. (1976) *Recent Adv. Tob. Sci.*, **2**, 80-111.
11 Kallinos, A.G. (1976) *Recent Adv. Tob. Sci.*, **2**, 61-79.
12 Leffingwell, J.C. (1976) *Recent Adv. Tob. Sci.*, **2**, 1-31.
13 Ogonowski, J.W., Rudra, L. (1976) *East Afr. Agri. For. J.*, **41**, 298-303.
14 Wagner, G.J., Yeargam, R. (1986) *Plant Physiol.*, **82**, 274-279.
15 Chaplin, J.F. (1975) *Beitr. Tabakforschung.*, **12**, 233-240.
16 Man, T., Matzinger, D.F., Wemsman, E.A. (1975) *Tob. Res.*, **1**, 1-12.
17 Chakraborty, M.K., Patel, G.J., Patel, B.K., Ghelani, L.M., Tewar, M.N. (1982) *Tob. Res.*, **8**, 43-52.

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