

NITRATE IN TOBACCO – ANOTHER SOURCE OF DANGER OF SMOKING

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Abstract:

Despite of the well-known health-damaging consequences, 40-45% of Hungarian adult population is smoking. Numerous publications reported presence of NO_x gases in tobacco smoke [1, 2] that can be transformed to destructive nitric acid in the human organism. The origins of these dangerous gases are the nitrogen compounds of vegetal proteins or – in other opinions – nitrates and nitrites from oxidizer additives. We determined the nitrate content of different types of cigarettes and detected 5-30 mg nitrate in 1 gram tobacco. It is doubtful how nitrate is generated into cigarettes because it is not included on the list of the licensed tobacco additives [3].

Keywords:

nitrate, additive, tobacco, cigarette

1. INTRODUCTION

Tobacco smoke is very complex mixture with over 4000 identified constituents – included lots of hazardous – harmful, toxic, carcinogen and mutagen – compounds. NO_x gases are one fraction of these compounds and by transforming to nitric acid during the burning process they can cause serious injury in the tissues of the lungs and in other mucous membranes. We tried to verify that the sources of these NO_x gases are – at least partly – nitrates and nitrites. We determined nitrate content of 20 different tobacco products according to the Hungarian standards' colorimetric methods [4].

2. MATERIALS AND METHODS

Each sample was made from one cigarette's tobacco amount (~0.5-0.6 g) that was mixed with 20 cm³ distilled water at 300 revolutions per minute then filtered with paper filter. Ideal soaking time (5 minutes) was measured by sharing the tobacco content of a single cigarette to about 0.1 g portions (Figure 1.) because of the relatively high differences between nitrate concentrations of the cigarettes from same box (Figure 2).

The nitrate measurements are based on the reaction of sodium salicylate and nitric acid (issued from the reaction of nitrate and cc. sulphuric acid) that results a yellow nitro-compound of which's absorbance is proportional to nitrate concentration in the sample. During the procedure after 1 cm³ 0.03 M sodium salicylate was added to 5 cm³ of the sample, water was evaporated on water bath at 95°C. The dry residual was wetted with sulphuric acid, and after 10 minutes the solution was diluted

with 30 cm³ distilled water, finally the medium was alkalinized with 7 cm³ 10 M sodium-hydroxide. Then the volume was completed to 50 cm³ with distilled water and in one hour we measured the absorbance of the solution spectrophotometric at the wavelength of 410 nm. The exact nitrate concentrations were read from a calibration graph, recorded with different concentrations of potassium nitrate solutions (Figure 3).

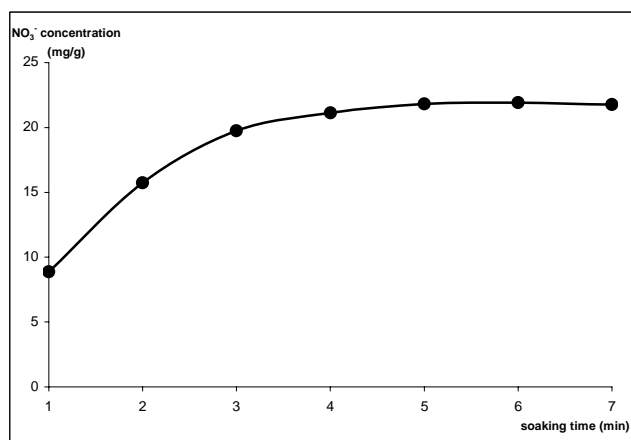


Figure 1. Changing of tobacco's nitrate content in relation of soaking time (Bond Street, red) – the tobacco content of a single cigarette was shared to 7 portions (~0.1 g)

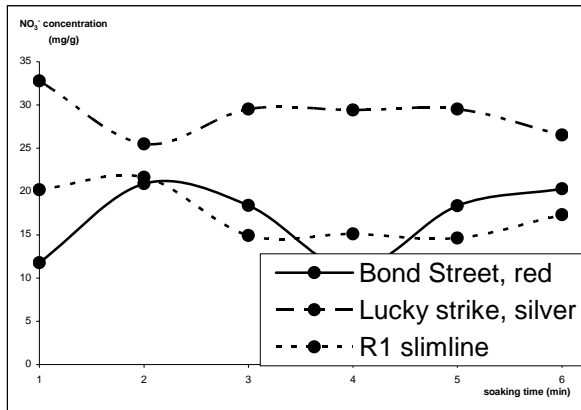


Figure 2. Changing of tobacco's nitrate content in relation of soaking time – samples were made of entire tobacco content of 6 cigarettes of same brand

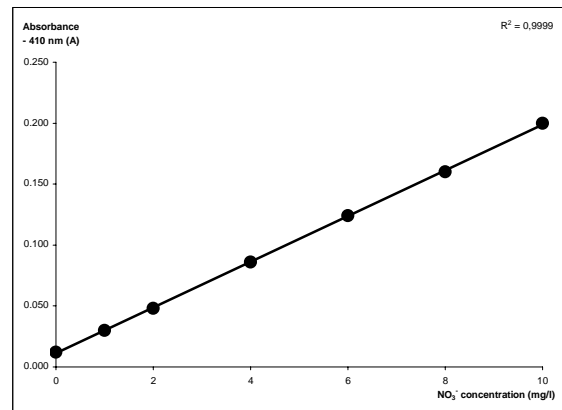


Figure 3. Calibration graph of nitrate determinations

3. RESULTS

However results varied between comparatively wide limits (6.1-29.5 mg/g), presence of nitrate was general; nitrate was detected in every examined tobacco product. One cigarette's average content was 10 mg nitrate. Concentrations of cigar and pipe tobaccos were similar to the cigarettes' results. The results are summarized in Figure 4.

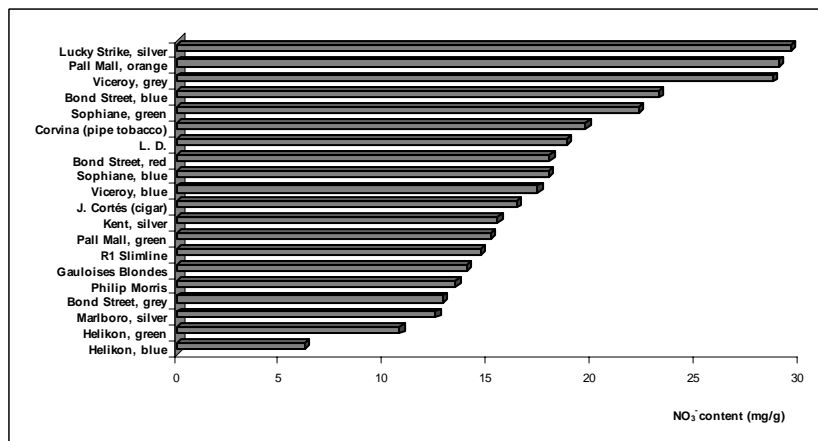


Figure 4. Nitrate content of tobacco products

4. CONCLUSIONS

Both nitrate accumulation (as a consequence of chemical fertilizing) and burning booster additives (e.g. potassium nitrate) are possible sources of the tobacco products' nitrate content. The second assumption seems to be confirmed by the fact that nitrate concentration of tobacco solution is permanent after 5 minute of soaking; nitrate content of the vegetal cell can not be solved so fast without some kind of cell destructive mechanism. This inference can be justified if we examine the nitrate content of the cigarettes from the same box: the high differences (~30%) can be explained with the unbalanced distribution of the oxidizer nitrate compounds sprayed on tobacco leaves or added to the pickle. Considering the above it is very notable that nitrate compounds are not included in the list of permitted additives of tobacco products [3].

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