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SUPERCRITICAL CO_2 EXTRACTION OF TOBACCO WASTE

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INTRODUCTION

Improper management and illegal dumping of waste, particularly hazardous and toxic waste, possess increasing threats to the environment and human health. Production and processing of tobacco is an area which is constantly growing, developing new products and try to ensure high production efficiency. Nevertheless, a large amount of tobacco waste is produced which is hazardous due to the high content of nicotine. These type of waste can be used for production of reconstituted tobacco sheets and as a fuel but that utilization are less effective because of presence of high concentration of nicotine and reducing sugars. Furthermore, tobacco waste is a material rich in active compounds. Treatment of wastes such as recycling and reusing are today an imperative due to rigorous environmental protection legislation. Tobacco wastes are consisted of leaf parts named tobacco scrap, very small particle named dust and midrib parts. Since they are derived from tobacco leaves, they contain all compound as leaves but in different concentrations. Supercritical CO_2 extraction of bioactive components, including nicotine, is a new possibility of utilization such type of waste.

MATERIALSAND METHODS

Tobacco waste (scrap) was obtained from “Fabrika Duhana Sarajevo” from Bosnia and Herzegovina. A series of operational parameters of supercritical fluid extraction of tobacco waste (pressure: 100–300 bar, temperature: 40–80 °C, were investigated in a laboratory scale apparatus. CO_2 mass flow rate was kept constant during the process. The content of nicotine was determined using by gas chromatography (GC-MS).
The GC-MS analyses were performed on an Agilent Technologies (Palo Alto, CA, USA) gas chromatograph model 7890A equipped with a mass selective detector (MSD) model 5977E (Agilent Technologies) and HP-5MS capillary column. The compounds percentage composition was calculated from the GC peak areas using the normalization method (without correction factors). The component percentages were calculated as mean values from duplicate GC–MS analyses of all extracts.

RESULTS

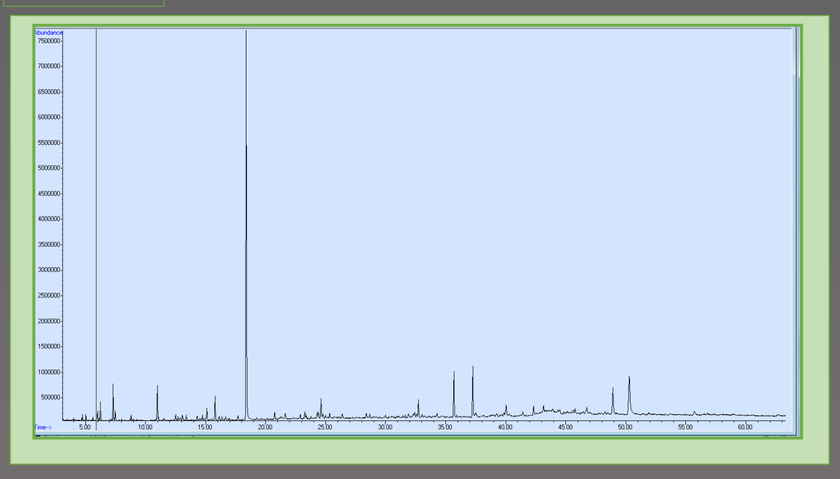
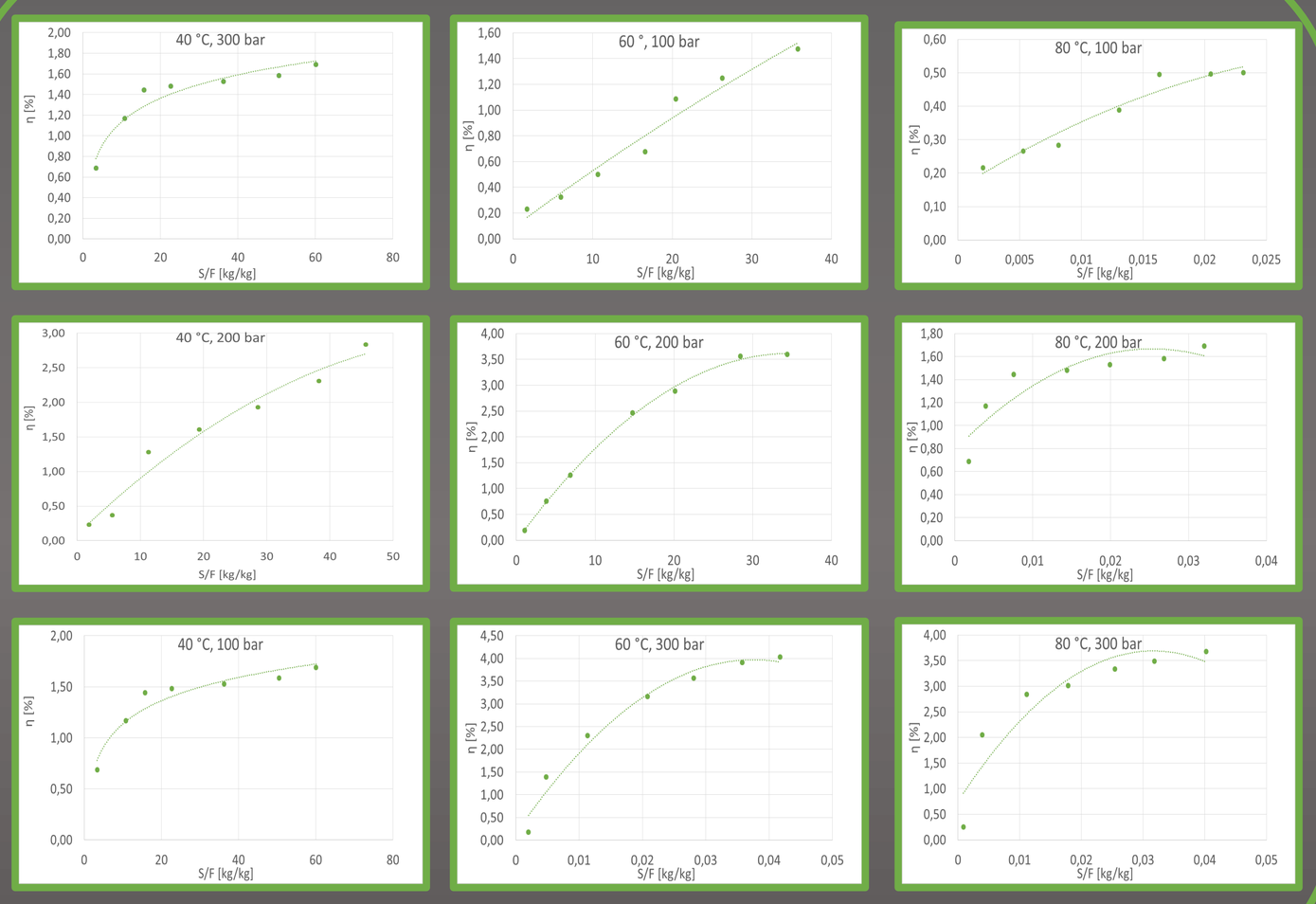


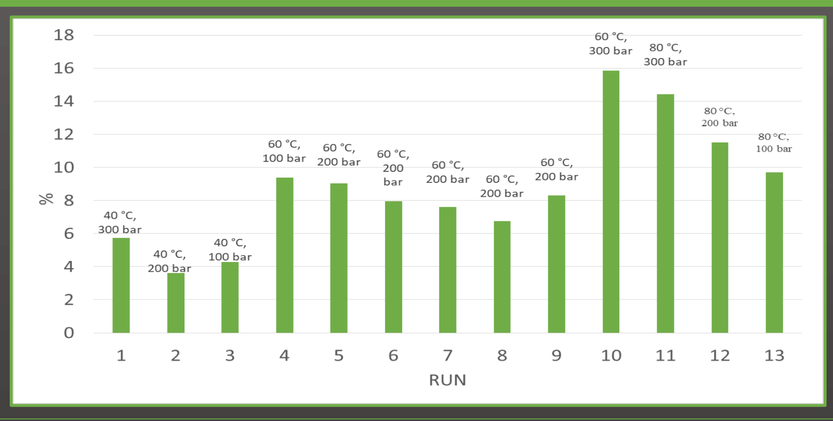
Figure 1: GC-MS Chromatogram of detected nicotine in SFE extract, run 9

Table 1: CCD experimental design

RUN	Pressure (bar)	Temperature (°C)
1	200.00	60.00
2	300.00	60.00
3	200.00	60.00
4	300.00	40.00
5	200.00	40.00
6	200.00	60.00
7	300.00	80.00
8	100.00	80.00
9	100.00	40.00
10	200.00	60.00
11	200.00	80.00
12	200.00	60.00
13	100.00	60.00



Graph 1-9: SFE of tobacco waste at different pressures and temperatures



Graph 10: Comparison of nicotine content at different temperatures and pressures

CONCLUSION

The results show that the extraction yields were significantly affected by applied operational extraction parameters. The increase in pressure, temperature improved the extraction yield. This method showed to be effective at two levels. First, produced high-value bioactive compounds can be implemented into new products. Secondly, after extraction waste becomes more suitable for some other application or disposal.

Acknowledgments
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