Rapid instrumental control of ash content of spices /paprika, pepper/ for use in the meat industry

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Ash content determination based on conductivity measurement is already used as a rapid method in the foodstuffs industry in some places /PLEWS, 197o/. The ash content corresponds to the inorganic matter content of foodstuffs, drinks and other consumer goods of plant and animal origin. The bulk of the inorganic matter content consists of salts dissociating in aqueous solution; if the ash content of the sample under study is constant or of characteristic composition, therefore, the electrical conductivity of an aqueous extract of the sample is directly proportional to the ash content. This means that the electrical conductivity of an aqueous extract of a sample is constant only if it has a constant quantitative and qualitative ash content. The method is thus suitable for the control of the ash content and for the differentiation of samples with satisfactory or unsatisfactory ash contents.

We have been unable to find in the literature methods based on measurement of electrical conductivity for the control of the ash content of spices. Of the spices used in the meat industry, it would be important to control the ash contents of paprika and pepper, for there is an inverse proportionality between the quality of milled paprika and its ash content, and conclusions may be drawn from the ash content of the pepper as to the origin, variety and quality of the spice.

We set out to develop a cheap and rapid instrumental procedure readily applicable in small and large meat plants, for the on-site factory contrd pf the ash content and quality of milled paprika and pepper.

In our investigations we studied what correlation exists between the ash content measured on the basis of the electrical conductivity and that determined by an ashing procedure, for milled paprika samples belonging in different quality categories /"csemege", "édesnemes", "félédes", "rózsa", "erős"/. Aqueous extracts were prepared for the electrical conductivity measurements. The means of this preparation is important; our technique was as follows: 1 g milled paprika is mixed with 3o cm^3 bidistilled water for 3 minutes at room temperature with a laboratory stirrer operating at 2ooo r.p.m. The volume of the suspension is made up to 1oo cm^3 and the conductivity is measured after the suspension has sedimented out. The means of stirring in preparation of the extract is important from the aspect of the measurement. With the stirrer operating at 2ooo r.p.m. the electrical conductivity of the resulting extract from a given milled paprika /mean of 5 measurements/ was o,958 $\pm$ o,o11 mS, while with a lower-performance laboratory magnetic stirrer it was o.95o $\pm$ o.o17 mS, i.e. a higher S.E.M. As regards the reproducibility of the electrical conductivity of a paprika extract, the mean of 1o measurements within 6o minutes was o.954 $\pm$ o.o1o mS, with a coefficient of variation of 1 %.

Table 1 presents certain chemical parameters and the electrical condictivities of aqueous extracts prepared as above from milled paprika samples belonging in different quality categories, i.e. with different ash contents.

Regression equations were calculated from the data in Table 1 for the conductivity results relating to the two states. These equations and the correlation coefficients r and r^2 indicating the strength of the linear correlation are given in Table 2.

Table 2. Regression equations

Measurement series	a	b	Regression equation	r	r^2	s/E/
A $/x_1/$	-3,319	9,911	$y=-3,319 + 9,911\ x_1$	o,956	o,915	$\pm$o,238
B $/x_2/$	-2,949	8,728	$y=-2,949 + 8,728\ x_2$	o,953	o,9o9	$\pm$o,246

A $/x_1/$: electrical conductivities relating to air-dry mass of paprika sample taken.

B $/x_2/$: electrical condictivities relating to dry-matter content of paprika sample taken.

a, b : constants; r: correlation coefficient; s/E/: scatter about regression line, in % ash content.

Statistical evaluation demonstrates that the ash content of milled red pepper can be established by measurement of the electrical conductivity within an error of 1o rel. %, which is satisfactory for rapid factory control and for the differentiation of paprika batches of suitable or unsuitable quality.

Procedure for determination of the electrical conductivity of an aqueous extract of paprika: 1 g milled paprika is mixed with 3o cm^3 bidistilled water for 3 minutes at room temperature in a 15o cm^3 beaker, with a stirrer operating at 2ooo r.p.m.

Table 1. Ash contents and electrical conductivites of milled paprika samples

Quality category	Water %	Ash %	Conductivity [+] mS /x_1/	Conductivity [++] mS /x_2/
Csemege paprika	7,57	5,25	o,880	o,952
	8,1o	6,29	1,o1o	1,o99
	8,17	5,8o	o,92o	1,oo2
	8,16	5,92	o,94o	1,o24
	8,13	5,67	o,93o	1,o12
	8,12	5,86	o,95o	1,o34
	7,88	5,46	o,87o	o,944
	8,8o	6,31	1,o2o	1,118
	8,47	5,8o	o,96o	1,o49
	9,78	6,o1	o,935	1,o36
Édesnemes paprika	8,28	6,17	o,935	1,o19
	7,78	6,o6	o,935	1,o14
	7,95	6,oo	o,925	1,oo5
	8,1o	5,8o	o,92o	1,oo1
	7,93	6,o6	o,97o	1,o54
	8,46	6,62	1,ooo	1,o92
	8,54	6,71	o,995	1,o88
	8,56	6,25	o,99o	1,o83
	8,54	6,16	o,975	1,o66
	9,1o	6,oo	o,9o5	o,996
	9,12	6,o7	o,925	1,o18
	7,62	5,66	o,92o	o,996
Félédes paprika	8,o2	6,oo	o,93o	1,o11
	8,41	6,42	1,o45	1,o32
Rózsa paprika	9,oo	7,8o	1,12o	1,231
	9,oo	8,oo	1,15o	1,264
	8,91	7,8o	1,14o	1,252
	9,53	6,81	1,o2o	1,127
	9,61	6,91	1,o5o	1,162
	8,88	7,79	1,o95	1,2o2
	8,89	7,66	1,o95	1,2o2
	8,18	7,43	1,o8o	1,176
	8,12	7,37	1,o7o	1,165
Erős paprika	8,96	7,87	1,13o	1,241
	7,73	8,o9	1,o8o	1,17o

\+ : Data relating to air-dry state

++ : Data relating to dry-matter content

The specific electrical conductivity of the bidistilled water is 1o /uS/cm. The suspension obtained is washed into a 1oo cm^3 volumetric flask, and the mixture is made up to the mark with bidistilled water. The suspension is transferred to a 15o cm^3 beaker and allowed to sediment out, and the electrical conductivity of the solution is then determined at room temperature.

The unknown ash content of a paprika sample is established by means of comparison with a calibration plot produced graphically from the electrical conductivity data of aquous extracts of milled paprika samples the ash contents of which were also determined by the ashing procedure.

This technique is also suitable for the determination of the ash content of the ash content of pepper, but the relative error of the analysis is then about 2o %.

To summarize: the measurement of the electrical conductivity of an aqueous extract is proposed for the rapid factory control of milled paprika samples belonging in different quality categories. The relative error in the determined paprika ash content is within 1o rel.%. The procedure is also suitable for the rapid factory control of the as contents of pepper samples of various origins and natures, but the relative error is then about 2o %.

Reference:

R.W. Plews: Analytical Methods in Sugar Refining. Ch. IV. pp. 23-36. Elsevier. 197o.