DISCRIMINATION AND CLASSIFICATION OF THE TYPICAL ITALIAN MORTADELLA RECIPES ON THE BASIS OF CHEMICAL COMPOSITION .

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SUMMARY

In this work simple chemical parameters derived from proximate composition were used in discriminant analysis to classify Italian typical mortadella, according to the principle that linear combinations of independent variables, called predictors, form new variables capable of describing the system better than the original and are the basis for successive classification. These discriminant functions were also used to evaluate the effectiveness of all single parameters chosen to represent the quality : two suitable functions have been found for the set of analytical data otained on the lean mixture and on the product in toto. The use of these functions gives a primary distinction of products diffused on the market, with a percentage of correct classification of 77 %.

INTRODUCTION

Italian mortadella is a fine grain sausage consisting of a mixture of pork and beef, blended with small cubes of fat, salt, flavours and additives, according to the original recipes of old Italian tradition. This mixture after blending and stuffing is partially dehydraded and cooked in air ovens. (Pedrielli et al., 1985 a and b). It must be underlined that in recent years for mortadella and other typical products it is essential to characterize the formulas. In Italy there is no fixed legislation for compositional standards, so that the formulations present on the market differ according to forgetful decoming to forgetful the market differ according to fancyful denominations. Even planning correct sampling and analytical approach, the problem of gathered data interpretation remains , the problem of gathered data interpretation remains, owing to a jumble of parameters and quality indices quoted in different laboratories. The proximate chemical composition and other deriving chemical parameters supply a first response to the pecersity of clearing and the response to the response supply a first response to the necessity of classification . In this work discriminant analysis was applied (Hand, 1981), according to the principle that linear combinations of independent variables called predictors, form new variables, capable of describing the products, grouping them. The new variables are the discriminant functions, used also to evaluate the relative effectiveness of all single parameters chosen to describe the quality. Nevertheless some limits remain such as the control of the content of swine stomachs, which is only partially noted through the control of hydroxyproline . However the importance of simple proximate composition and of protein free from collagen was reaffirmed, giving a primary distinction of the different formulations existing in commerce .

MATERIALS AND METHODS

47 samples of typical Italian Mortadella formulations based on pork only were supplied by different firms, that on the market are distinguished through fanciful denominations into three classes of different quality. The first quality generally doesn't contain polyphosphates, in the 2nd and 3rd quality they may be present.

Chemical measurements. On the samples in toto and on the lean part, separated from fat cubes, protein, fat, ash, and water content, as AOAC

procedures were determined. The hydroxyproline concentration was determined by ISO procedure 3496. From these measurements some parameters were deduced. Chemical parameters calculated on sample in toto. $Pr_T \% = total protein content$, in percent;

 Cl_{T} % = total collagen content, in percent;

 $Gr_{r_1} \% = \text{total fat content}$, in percent;

 $U_{\rm T}\%$ = total humidity content , in percent ;

 $PM_T \% = Pr_T \% - Cl_T \% = collagen free protein content, in percent, equivalent to BEFFE value (Kube, 1976)$

 $(Cl_r\%/Pr_T\%) \times 100 =$ collagen contribution to total protein;

 $(PM_T \% / Pr_T \%) \ge 100 =$ collagen free protein content, in percent, equivalent to BEFFE in FE value (Kube, 1976); $G_{\Gamma_T} % / P_{\Gamma_T} % = fat on total protein ratio;$

 $U_{\rm T}\%/Pr_{\rm T}\%$ = fat on total protein ratio .

 $C_{hemical}^{hemical}$ parameters calculated on products separated from fat cubes. The same parameters previously defined were determined on the lean portion and will be indicated in the following discussion with the same symbols and the letter M instead of T, in apex.

Statistics . The elaboration of T and M data was done with the Discriminant procedure of SPSS Package, adapted on PC Compaq 386/33L.

RESULTS AND DISCUSSION

The classification of meat products and of food in general on the basis of compositional characteristics is a relevant relevant part of internal quality definition, prevalently directed towards consumer defence. On the other hand ^{compositional} characteristics are not always related to consumer quality grades (Rhodes et al., 1980). The aim of this : of this investigation was to evaluate the compositional parameters and their relative importance on a partial quality. The contribute of chemical grades to the final Quality grading scale based only on objective determinations. The contribute of chemical grades to the final correct of the single parameters and their linear ^{conrect} classification was evaluated with Discriminant Analysis applied to single parameters and their linear combinations .

 $P_{r_{T}}^{\text{binduons}}$. $P_{r_{T}}^{\text{binduons}}$ and $P_{r_{M}}^{\text{binduons}}$ are obtained by the Nitrogen amount, measured with Kjeldall apparatus. Both sarcoplasmatic and hindi and Pr_M % are obtained by the Nitrogen amount, measured with Rjetour approximately and binding tissue contribute to these parameters, and foreign proteins, animal and vegetal, if they are used in the formula the formulation, besides non proteic N contribute. P_{M92}

^{Aumulation}, besides non proteic N contribute. ^{Aumulation}, besides non proteic N contribute. ^{Aumulation} on the other hand gives the specifications of quality proteins : free from binding tissue . In mortadella ^{Aumulation} of proteins deriving from pig stomach, partially formulations of lower quality however a certain amount of proteins, deriving from pig stomach, partially increase a true of the formulations of th n_{crease} MP% value, but certainly not the quality characteristics of the formulations . $Cl_{\%,i}$

 $C_{l}^{\text{vase}} MP\%$ value, but certainly not the quality characteristics of the formulations of the formulations, stomachs, stomacher informative parameter on binding tissue content, introduced by head trimmings, stomaches, stomacher informative parameter on binding tissue content, introduced by head trimmings, stomaches, stomacher informative parameter on binding tissue content, introduced by head trimmings, stomaches, stomacher informative parameter on binding tissue content, introduced by head trimmings, stomaches, stomacher informative parameter on binding tissue content, introduced by head trimmings, stomacher, stomacher informative parameter on binding tissue content. $\frac{1}{2}$ shows another informative parameter on binding tissue content, introduced by $\frac{1}{2}$ such that $\frac{1}{2}$ another informative parameter on binding tissue content, introduced by $\frac{1}{2}$ and $\frac{1}{2}$ another poor components that may be employed to lower the cost of formulations.

 G_{r} % generally its value is higher than 25 %, for one half it is due to the amount of fat cubes included in the lean mixt. l_{ean} mixtures : the amount of fat in the lean comminuted portion changes over a relatively restricted range, ca. $l_{S} \ l_{B} \ s_{s}$ 15/18% of fat; this amount must be low in typical formulations because the mortadella is not an emulsified product and fat; this amount must be low in typical formulations because the mortadella is not an emulsified (Product and the addition of pre-emulsified fat results in a finished product with poor texture characteristics (Pizza A., 1982).

Besides the single values, some linear combinations were also used, as $(Cl_T \% / Pr_T \%) \ge 100$ and $(PM_T \% / Pr_T \%) \ge 100$ and $(PM_T \% / Pr_T \%) \ge 100$. $p_{r_1}^{\text{rades}}$ the single values, some linear combinations were also used, as $(C_{17}, C_{17}, C_{17},$ deriving proteins raises in the formulation, the correspondence between these two parameters and the quality may become may became confused .

The parameter $U_T \% / Pr_T \%$, that is generally very important for other meat products, may be proved useless for mortadely $C_T \% / Pr_T \%$, that is generally very important for other meat products, may be caused by the $f_{or mortadella} = U_T \% / Pr_T \%$, that is generally very important for other mean products, may be pure usage of high usage of high quality ingredients, such as shoulders, that contain more water in respect of other components of less nutrition of a lower quantity of fat less nutritional value such as head trimmings, or it may also be caused by the usage of a lower quantity of fat

Discriminant analysis, carried on all the variables, confirmed the distribution of the multitude of the products analyzed into the second deviation of all M and T variables ^{analyzed} into three classes. In table 1 the values of the mean and standard deviation of all M and T variables are reported. are reported, for each of the three commercial classes. All variables passing the tolerance test are entered in Discriminant A $D_{iscriminant}$ Analysis with the direct method; therefore we found two canonical functions (Fig. 1 and 2). $P_{unction 1}$ the direct method; therefore we found two canonical functions (Fig. 1 and 2). $^{(63)}$ and PM/Pr (r=.53). Function 2 is correlated to $U_T \%$ (r=.50). In Fig.3 the scatter plot is represented with the difference of the scatter plot is correlated to $U_T \%$ / Pr_T % (r=.50). In Fig.3 the scatter plot is correlated to $U_T \%$ / Pr_T % (r=.50). ¹³ and PM/Pr (r=.53). Function 2 is correlated to $U_T % / Pr_T %$ (r=.50). In Fig.3 the scatter proceeder of cases with the position of three groups centroids. The last option used gives the percentage of cases correctly classified to the function 1, expressing quantity and quality of protection of the processing quartity and quality of protect

^{presented}, with the position of three groups centroids. The last option used gives the percentage of correctly classified that is 76.6 %. For the first class the function 1, expressing quantity and quality of proteins the second cloud is given by a buffer class with less defined is largely positive and F2 is slightly negative. The second cloud is given by a buffer class with less defined that is of U/Pr parameters characteristics, which in respect to the other two classes tends to reach the highest values of U/Pr parameters.

The third type of product is the most correctly classified: the only SB recipe (swine and beef meat mixture) is the last point on the scatter plot, with the most negative coordinates. In a similar way these graphycs could be of utmost importance as a reference point for each further investigation on physical and sensorical characterisics for a complete definition of quality standards and the classification of typical formulations.

CONCLUSIONS

All the compositional data collected on typical mortadella formulation diffused in our country, were interpreted with Discriminant Analysis. With the aid of the two canonical function : F1, correlated with meat proteins and F2, correlated with water content, we defined a plane, which can be used as a map, where it is easier to check the products for their quality in respect to the use of the single chemical parameters. Substancially the classes identified correspond to the information given on the label (in other terms the situation is less confused than expected), although this cannot be considered sufficient, not clearly related to quality standards and must be substituted by more precise indications. These two canonical functions may be used to check the different compositional parameters for their efficacy in the internal quality planning. As the chemical composition is related to other aspects of quality such as nutritional, sensory, ecc., the functions defined by DA must be considered as an important contribution to the complete caracterization of the typical products.

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