



Garlic powder: an alternative for reducing salt addition in beefburgers of bovine meat

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INTRODUCTION

At present consumers have marked a clear tendency toward food selection that show good sensorial qualities, and that also, possess some beneficial characteristics for health. Food with both attributes is called functional foods. Garlic (*Allium sativum* L.) contains phytochemicals (fructans and organosulfured compounds), which because of its nature can be categorized as a functional food. It also possesses mineral salts, sugars, lipids, proteins, saponosides, terpenes, vitamins and enzymes. Among organosulfured compounds is *S*-allyl-cysteine sulfoxide, well-known as alliin, which is an odorless chemical substance. When garlic is crushed, alliin is transformed in allicin, discovered by Cavallito and Bailey (1944). This active component is the one that is better biologically characterized. It has been demonstrated that it possesses, among others, antibiotic, hypolipidemic, antithrombotic, hypoglycemic, anticancer effects. At present, studies are being carried out in order to prove these effects in patients with moderate arterial hypertension. Another active garlic component is ajoene, which is formed from allicin, and prevents artery hardening, that is to say heart attack risk.

On the other hand, the negative influence of salt intake in persons with hypertension has been thoroughly demonstrated. The incorporation of garlic powder in beefburgers of bovine meat would add the beneficial properties of allicin, reducing of salt content in this food. However, it should be taken into account that, the characteristic flavour, aroma and retro-taste of garlic results in dislike for a wide consumer sector. This work was carried out in order to determine by sensorial evaluation, one of the very important tools in food industry, the garlic powder

dose that allowed to formulate bovine meat hamburgers with low content of salt and the wished sensorial characteristics.

METHODOLOGY

Garlic powder.

Sureño INTA garlic cultivar, belonging to the INTA La Consulta germplasm bank was used, which contains high allicin levels. In the Laboratory of Analysis of Toxic Residues of the Facultad de Ciencias Agrarias (Universidad Nacional de Cuyo, Argentina) garlic cloves were cut into slices, dehydrated at 50°C (Lawson, 1991) and powdered. The powder was kept in a brown-coloured glass flask under nitrogen atmosphere.

Alliin content was determined by HPLC, using an aqueous solution of pure allicin, as external standard for quantification. Allicin concentration in garlic powder was measured by comparison of the peak area of the powder with that corresponding to pure allicin in aqueous solution.

Preparation of beefburgers.

A homogeneous mass that contained 85% of bovine meat and 15% of bovine fat was prepared, and further divided in three equal portions, to which salt was incorporated to reach a concentration of 0%, 0.1% and 0.5 % sodium chloride. Each portion was further divided into two fractions, and garlic powder was added to each one until reaching a concentration of 0.13% and 0.65%, respectively. After each addition, the mixture was homogenized. With the material of the six treatments, hamburgers of 50 g each were obtained, which were cooked until an internal temperature of 72 °C was reached.

Sensorial evaluation was carried out by a panel of



16 partially trained evaluators that analysed the samples and coded them with numbers of three digits, according to a balanced design. Parsley leaves and lemon juice were used as flavour neutralizers.

The considered attributes were: juiciness, flavor (garlic, meat); aroma (garlic, meat) and retro-taste. The quantification of the intensities was performed by means of sensorial scales of 3 points for juiciness (1 = Dry, 3 = Juicy) and the remaining attributes were qualified as Very perceptible to Non-perceptible (punctuations 1 at 5). Likewise, it was requested to order them by preference according to garlic flavor.

Statistical analysis.

Results of the tests were explored by descriptive (sensorial profile of the samples) and inferencial analysis through the non parametric tests of Friedman corrected for ties, of multiple comparisons and of Kramer, all for an $\alpha = 0.05$, considering the ordinal character of data.

RESULTS AND DISCUSSION

Allicin concentration in garlic powder was 16.3 mg/g expressed as dry matter.

Sensorial profiles of samples with 0.13% garlic powder, and different salt doses are shown in Fig. 1 and 2.

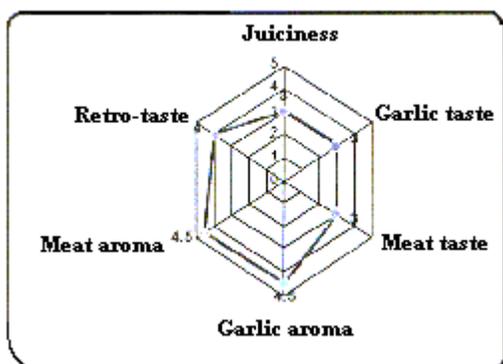


Figure 1. Sensorial profile of the beefburger formulated with 0.50% salt and 0.13% garlic powder.

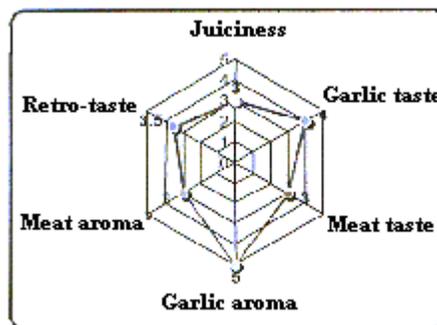


Figure 2. Sensorial profile of the beefburger formulated with 0.10% salt and 0.13% garlic powder.

To the sample with 0.5% salt (equivalent to 0.196 g sodium %g product) and 0.13% garlic powder the 50% of the evaluators found it 'juicy', the garlic and meat flavour reached a median of 'perceptible' while the garlic and meat aroma 'a bit perceptible and non-perceptible', and with regard to retro-taste 'not very perceptible'. On the contrary, in the beefburger with 0.10% salt and the same concentration of garlic powder the mean of garlic and meat flavour were 'not very perceptible and perceptible', respectively. As for garlic aroma the median was 'non-perceptible' and the one of meat aroma 'perceptible'. The retro-taste attribute reached a punctuation of 'fairly perceptible'.

The tests of Friedman and of multiple comparisons indicated that those beefburgers didn't differ in juiciness. The sample with major concentration of garlic and salt, differed significantly to the other ones for its flavor, aroma and retro-taste; but among the remaining ones differences were not detected. In the flavor and aroma to meat significant differences were presented between the control and that of major dose of garlic.

The test of Kramer came out that the rejected sample was that with major concentration of garlic and salt, for a significance level of 0.05.

CONCLUSIONS

Under test conditions, it can be inferred that:

- * Garlic concentration of 0.65% is not adequate for the formulation of this food system.
- * It is feasible to reduce salt addition to beefburgers of bovine meat by means of the addition of 0.13% of garlic powder, obtaining a



food with good sensorial qualities.

* An acceptability test should be carried out with consumers, considering among stratifications the tendency: low, median or high garlic consumption.

Note: This study was presented at the 'I Reunión de Biotecnología aplicada a plantas medicinales y aromáticas' (First Biotechnology Meeting on Medicinal and Aromatic Plants), Córdoba, Argentina, 2006.

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