

The meat industry is one of the most important in the Spanish food area. Meat can be produced and sold as a fresh product, as a cooked one and also as a typical dry-cured one in the Mediterranean area, i.e. dry cured ham, cured and fermented sausage and "sobrassada" among others. These products have a big economic importance by themselves and as a development of the meat industry for their commercial possibilities. In 1997, the production of raw cured meat products was 353500 T (Anonymous, 1998). Dry-cured hams production accounted for 51.6% of the mentioned amount.

The industrial manufacturing process of Spanish dry-cured ham is based on the traditional one, which relies on natural climate, where salting and postsalting is done in winter, at temperatures between 0°C and 12°C and relative humidity between 70 and 90%. The drying, maturing and ageing is carried out following the climate conditions at each period of the year. The outcome of ageing hams in spring and summer is a reduction in moisture content and the development of the main aromatic compounds. Dry-cured hams have a final moisture content between 28 and 60% and salt content between 3% to 9% in different muscles (Arnau *et al.*, 1995). The high salt and low moisture content allows storage without refrigeration.

Drying takes the longest time in the process of dry-cured ham; it is a very important stage, totally decisive to what quality and price is concerned. In the manufacture of dry cured ham industry there are two main aspects involved. On the one hand we have the knowledge of the technology in the elaboration of dry-cured ham, which means that, the ham must be salted to certain amount and dried and matured in the correct way to obtain the desired quality (colour, texture, and flavour). On the other hand, we have the knowledge related to the drying equipment, which is used to control the ambient air conditions (to simulate the

traditional drying conditions). That proves two differentiated branches. The former supported by the thechnologists who determine the aspects needed in the process and the latter led by the engineers who actually designed the drying equipments. Optimising the manufacture process lies on the success of treating both branches

During meat drying, water gradually goes from the inside of the meat to the outer part of it, there the water moves to the air through the boundary layer. Finally, the water diffuses from the boundary layer to the bulk air.

The drying rate dependens on the external and internal mass transfer resistance. Into the external the relative humidity, temperature, air velocity, pressure and, area and properties of the exposed surface are factors that must be considered. The humidity gradients between the ambient air and the product (water activity) gives the driving force for water to move. Depending on the relative intensity of the driving force, secondary effects like the crust formation or microbiological growth can appear, which may affect the product. The air velocity, will affect the boundary layer. Into the internal mass transfer properties, water diffusivity, structure, composition, salt content, water binding properties, among others must be known. The water activity is very important since the relationship between the water in the meat and the water in the air is given by the sorption isotherms (Rödel, 1989).

The problem of mass transfer in meat is quite complex. First of all, there is a lack of methods to measure in a simple way the local water content in the product during the process. Then, to deal with water is also difficult because it is the major component of the material, and its removal causes important structural changes in the material. It interacts with the other components of the medium, which may restrain the movement of water and its migration. It can be transported in different forms (liquid or gas) and by several mechanisms, which can take place at the same time and it participates in physic-chemical reactions. Finally, the meat has a fibrous structure and thus anisotropic one and can also differ because of its origin (type of muscle and characteristics of the animal, sex, breed, age,

nutrition, etc.), handling (pre- and post slaughter conditions and slaughtering process) and storage (refrigeration, freezing and thawing).

To evidence this complexity, the manufacturing process of dry-cured ham, the structure and composition of the ham and its muscles are described in the following sections. The water and its relationship with the meat is also described. Finally, water activity and water diffusivity are defined, and their study on meat is reviewed.

The aim of this thesis is to improve the knowledge of some of the internal factors (sorption isotherms and effective water diffusivity), which controls the water transport in noncomminuted salted meat products. Such knowledge is important to ameliorate the process of the dry-cured ham, which is currently the most outstanding meat product in Spain. Some properties of this product which can affect the water transport are also considered (composition, structure, pH).