

AMOUNT AND COMPOSITION OF THE MOULDS POPULATION ON DRY-CURED JINHUA HAM

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Introduction

Jinhua ham is representative of traditional Chinese meat products and is one of the famous dry-cured hams of the world, which is an uncooked, dry-cured meat product obtained after 8-10 months of ripening under natural environmental conditions. These characteristics, together with the low a_w reached, favour the development of an uncontrolled fungal population. Moulds are considered beneficial in the ripening of dry-cured meat products due to their positive effects on flavour and appearance (Lücke, 1986). The fungi from various fully ripened dry-cured hams have been studied in some detail (Leistner and Ayres, 1968; Rojas et al., 1991). Most isolates were *Penicillium* and *Aspergillus* species. However, little technical information exists about the changes in the fungal populations during the many months of ripening of Jinhua dry-cured hams. The evolution of the moulds population during ripening as well as the population on the final product need to be known. Our objective was to assess the amount and composition of the moulds naturally present during ripening of Iberian ham.

Materials and Methods

Fifty-one hams were processed as previously described (Zhao G M et al., 2005) and were analysed during the full processing (around 8 months). The production process has four phases: salting and pressing (around 1 month), washing and drying (around 2 week), ripening (5–6 months). At the middle of ripening (around 1 month) hams are trimmed to obtain a good-looking figure. 3 hams were sampled in the saline swab method as previously described (Motilva-Casado-MJ, 1991) every 15 days approx (sampling times are 5th and 20th of every month) from material to final product.

The samples were streaked onto Malt Agar (Malt extract 20 g, yeast extract 5 g, agar 20 g, distilled water 1 l, pH 6.0), which were incubated at 30°C for 3–5 days. Then, the colonies of the moulds were inoculated in three different agars: Czapek Dox Agar (Pitt, 1973), Malt Agar (Malt extract 20 g, yeast extract 5 g, agar 20 g, distilled water 1 l, pH 6.0) and Salt-Malt agar (Malt extract 50 g, NaCl 50 g, agar 20 g, distilled water 1 l, pH 6.2) and identified according to Raper and Fennell (1965) and Samson et al. (2000).

Results and Discussion

On the surface of the investigated hams, a different number of moulds strains was observed, considering the zone of taken samples and the phase of ripening. Amount of moulds on the surface of raw meat was in a low level. It increased slowly in cold storage, but drop to null in salting. It kept increasing in washing, drying and the early stage of ripening processing. The trimness in middle of ripening dropped it, but it increased again later. Moulds quantity decreased in the late period of ripening because of high temperature until the end of ripening. It can be concluded that the moulds on surface of Jinhua ham in processing maybe come from processing environment because the moulds of raw meat have been dropped to null in salting. The maximum of moulds amount is up to 10^7 cfu/cm² in the early stage of ripening, which was enough to effect quality of Jinhua ham. But moulds amount decreased to a low level in the late stage of ripening stage in which the characteristic favor of Jinhua ham formed. It supposed that moulds worked mainly in the early stage of ripening and did little with favor formation.

Table 1. Amount of moulds on the surface of Jinhua ham in processing

Sampling date	Amount of moulds(cfu/cm ²)	Sampling date	Amount of moulds(cfu/cm ²)	Sampling date	Amount of moulds(cfu/cm ²)
Dec. 5	42	Mar. 20	1.88E+05	June. 5	4.38E+06
Dec. 20	1.66E+04	Apr. 5	7.00E+05	June. 20	2.88E+06
Feb. 5	0	Apr. 20	3.70E+07	July. 5	3.60E+05
Feb. 20	2.64E+03	May. 5	4.42E+06	July. 20	8.00E+03
Mar. 5	1.44E+05	May. 20	1.08E+07	Aug. 5	9.20E+02

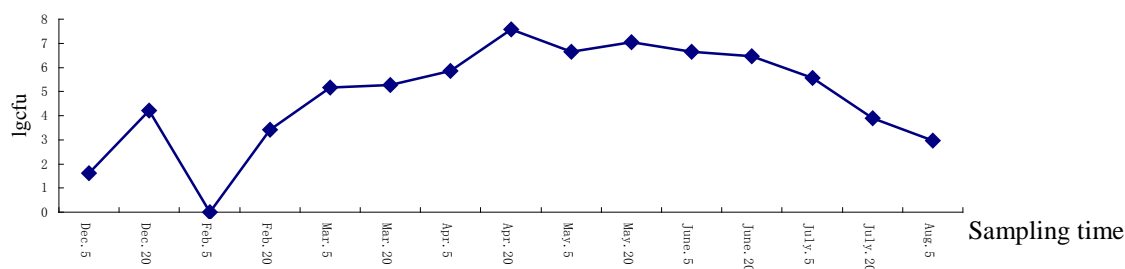


Figure 1. Amount of moulds on the surface of Jinhua ham in processing

A total of 374 strains were isolated. From the analysed hams during the early stage of ripening phase were isolated 206 strains and 168 strains from the late period of ripening phase. All the isolated strains belonged to 21 species (Tables 2). The mycoflora was mainly represented by five genera such as *Penicillium* spp., *Aspergillus* spp., *Botryosporium* spp., *Selenotila* spp. and *Glomerularia* spp. in all the different producers investigated. The identified species were similar in different samples, demonstrating that the contamination came mainly from the air and the seasoning chambers, rather than the raw meat.

Penicillium and *Aspergillus* species represented more than 89% of the isolates. Both *Aspergillus* and *Penicillium* have been recovered in high number in similar studies (Leistner and Ayres, 1968; Rojas et al., 1991). *Penicillium* spp. predominated in the early stage of ham production, because of the moderate temperature and the relative humidity of the environment which is subjected to the climatic conditions. The prevalence of *Aspergillus* strains during the ripening phase was mostly because of high temperature and low relative humidity as well as low a_w of ham. *Penicillium.italicum*, *P.simplicissimum*, *P.citrinum*, *P.frequentans* were the most frequently isolated *Penicillium* strains in the early stage of ripening. *Aspergillus.sydowi*, *A.glaucus*, *A.flauipes* were the most frequently isolated *Aspergillus* strains in the late period of ripening.

Sampling date	<i>Penicillium</i> spp.	<i>Aspergillus</i> spp.	Sampling date	<i>Penicillium</i> spp.	<i>Aspergillus</i> spp.
Feb. 20	16	5	May. 20	6	5
Mar. 5	10	4	June. 5	8	8
Mar. 20	14	3	June. 20	6	17
Apr. 5	41	17	July. 5	10	21
Apr. 20	22	9	July. 20	12	28
May. 5	23	13	Aug. 5	9	29

Table 2. Species of moulds isolated in Jinhua ham at the ripening phase

Conclusions

Jinhua ham is one of the best products of China. During the pre-ripening and the ripening phase, different moulds are formed on the dried ham surface. The contamination come mainly from the processing environment, rather than the raw meat. The moulds flora is variable and is mainly represented by *Aspergillus* spp., *Penicillium* spp. *Penicillium* spp. predominate in the early stage of ham production. *Aspergillus* spp. predominate in the late stage of ripening. Moulds may work mainly in the early stage of ripening and do little with favor formation.

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