Einige Eigenschaften fermentierter Dauerwurst hergestellt aus PSE und normalem Schweinefleisch

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Es wurden fermentierte Würste hergestellt, die entweder nur helles, weiches, wässriges (PSE) Schweinefleisch oder aber Schweinefleisch normaler Qualität enthielten. Die anfänglichen pH Werte der Würste, die PSE oder Schweinfleisch normaler Qualität enthielten, lagen bei 5.3 beziehungsweise 6.00. Während der Fermentationsphase der Herstellung, sank der pH Wert der Würste, die PSE Schweinefleisch enthielten, auf 4.5, der Würste, die Schweinefleisch normaler Qualität enthielten, auf 4.65. Der Wert sank nach 35 Tagen des Trocknens bei beiden Wursttypen auf 4.4. Zusammensetzungsänderungen (Fett, Eiweiß, Salz) während der Trocknungsphase standen signifikant in Wechselbeziehung mit dem Feuchtigkeitsverlust der Würste. Die TBA Werte der Würste, die PSE Schweinefleisch enthielten, waren höher als die der Würste, die Schweinefleisch normaler Qualität enthielten. Nach 7 Tagen des Trocknens hatten die Würste, die PSE Schweinefleisch enthielten, einen signifikant grösseren Gewichtsverlust als die Würste, die Schweinefleisch normaler Qualität enthielten. Hunter L, a_L b_L und a/b Verhältniswerte waren gleich für beide Wurstgruppen während jeder Phase des Prozesses. Dementsprechend ähnlich waren die Wasseraktivitätswerte (A_W) für beide Wurstgruppen während jeder Phase des Prozesse. Die Würste, die PSE Schweinefleisch enthielten, erforderten signifikant weniger Schnittkraft als die Würste, die Schweinefleisch normaler Qualität enthielten.

Some properties of fermented dry sausage prepared from PSE and normal pork

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Fermented sausages were prepared containing only pale, soft, exudative (PSE), or normal quality pork as the meat source. Initial pH values of sausages containing PSE or normal quality pork were 5.3 and 6.00, respectively. During the fermentation phase of processing the pH decreased to 4.5 for sausages containing PSE pork and to 4.65 for sausages containing normal quality pork, which decreased to 4.4 at 35 days of drying for both types of sausage. Compositional changes (fat, protein, salt) during the drying phase were significantly correlated to moisture loss of the sausages. TBA values were higher in sausages containing PSE pork than sausages containing normal quality pork. After 7 days of drying, sausages containing PSE pork had significantly greater weight loss than sausages containing normal quality pork. Hunter L, a_L, b_L and a/b ratio values were similar for both sausage groups at each process phase. Likewise, water activity (A_W) values were similar for both sausage groups at each process phase. Sausages containing PSE pork required significantly less shear force than sausages containing normal quality pork.

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Quelques propriétés des saucissons secs fermentés préparés avec de la viande de porc pâle, molle, exudative et de la viande de porc normale

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On a préparé des saucissons fermentés ne contenant comme viande que de la viande de porc pâle, molle et exudative (PSE) (pale, soft, exudative) ou de la viande de porc de qualité normale. Les valeurs pH initiales des saucissons contenant de la viande PSE ou du porc de qualité normale étaient respectivement de 5,3 et 6,00. Durant la phase de fermentation de la fabrication, le pH a décru de 4,5 pour les saucissons contenant de la viande de porc PSE et de 4,65 pour les saucissons contenant le porc de qualité normale, valeurs qui ont décru jusqu'à 4,4 au bout de 35 jours de dessication pour les deux types de saucissons. Les changements de composition (gras, protéine, sel) pendant la phase de dessication étaient en corrélation manifests avec la perte d'humidité des saucissons. Les valeurs TBA étaient plus grandes dans les saucissons contenant la viande de porc PSE que dans les saucissons contenant le porc de qualité normale. Après 7 jours de dessication, les saucissons contenant la viande de porc PSE avaient une perte de poids bien plus importante que les saucissons contenant le porc de qualité normale. Les valeurs des rapports Hunter L, a_L b_L et a/b étaient semblables pour les deux groupes de saucissons à chaque phase de la fabrication. De même, les valeurs de l'activité de l'eau (A_w) étaient semblables pour les deux groupes de saucissons à chaque phase de la fabrication. Les saucissons contenant du porc PSE ont nécessité bien moins de force pour les couper que les saucissons contenant le porc de qualité normale.

НЕКОТОРЫЕ КАЧЕСТВА ФЕРМЕНТИРОВАННОЙ КОЛБАСЫ, ПРИГОТОВЛЕННОЙ ИЗ БМЭ И ОБЫЧНОЙ СВИНИНЫ

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БЫЛИ ИЗГОТОВЛЕНЫ ФЕРМЕНТИРОВАННЫЕ КОЛБАСЫ, МЯСНОЙ ОСНОВОЙ КОТОРЫХ БЫЛА ИЛИ БЛЕДНАЯ МЯГКАЯ ЭКССУДАТИАЯ (БМЭ) СВИНИНА ИЛИ ЖЕ СВИНИНА ОБЫЧНОГО КАЧЕСТВА. ПЕРВОНАЧАЛЬНОЕ СОДЕРЖАНИЕ pH В КОЛБАСАХ БМЭ ИЛИ ОБЫЧНОГО КАЧЕСТВА СВИНИНОЙ БЫЛО СООТВЕТСТВЕННО 5,3 И 6,00. В ПЕРИОД ФЕРМЕНТАЦИОННОЙ ФАЗЫ ПЕРЕРАБОТКИ СОДЕРЖАНИЕ pH ПОНИЖАЛОСЬ ДО 4,5 В КОЛБАСАХ С БМЭ СВИНОЙ ОСНОВОЙ, КОТОРОЕ ЗАТЕМ СНИЖАЛОСЬ ДО 4,4 В КОЛБАСАХ ОБОИХ ТИПОВ ПОСЛЕ 35-ДНЕВНОГО ПЕРИОДА ВЫСУШКИ. ИЗМЕНЕНИЕ СОСТАВА (СОДЕРЖАНИЯ ЖИРА, БЕЛКА, СОЛИ) В ПЕРИОД СУШКИ В ЗНАЧИТЕЛЬНОЙ СТЕПЕНИ ЗАВИСЕЛО ОТ ПОТЕРИ ВЛАГИ В КОЛБАСАХ. СОДЕРЖАНИЕ ТВА БЫЛО ВЫШЕ В КОЛБАСАХ С БМЭ СВИНОЙ ОСНОВОЙ, ЧЕМ В КОЛБАСАХ С ОБЫЧНОЙ СВИНОЙ ОСНОВОЙ. ПОСЛЕ 7-ДНЕВНОЙ ВЫСУШКИ В КОЛБАСАХ, СОДЕРЖАЩИХ БМЭ СВИНИНУ, НАБЛЮДАЛАСЬ ЗНАЧИТЕЛЬНО БОЛЬШАЯ ПОТЕРЯ В ВЕСЕ, ЧЕМ В КОЛБАСАХ, СОДЕРЖАЩИХ СВИНИНУ ОБЫЧНОГО КАЧЕСТВА. СОДЕРЖАНИЕ ГАНТЕРА L, a_L, b_L И СООТНОШЕНИЕ a/b БЫЛО СХОДНО В ОБОИХ ВИДАХ КОЛБАС В ПЕРИОД КАЖДОЙ ФАЗЫ ОБРАБОТКИ. ПОДОБНЫМ ЖЕ ОБРАЗОМ СТЕПЕНЬ ВОДНОЙ АКТИВНОСТИ (A_w) БЫЛА СХОДНОЙ ДЛЯ ОБОИХ ВИДАВ КОЛБАС В ПЕРИОД КАЖДОЙ ФАЗЫ ОБРАБОТКИ. ДЛЯ КОЛБАС, СОДЕРЖАЩИХ БМЭ СВИНИНУ, ТРЕБОВАЛАСЬ ЗНАЧИТЕЛЬНО МЕНЬШАЯ СРЕЗЫВАЮЩАЯ СИЛА, ЧЕМ ДЛЯ КОЛБАС, СОДЕРЖАЩИХ СВИНИНУ ОБЫЧНОГО КАЧЕСТВА.

SOME PROPERTIES OF FERMENTED DRY SAUSAGE PREPARED FROM PSE AND NORMAL PORK

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INTRODUCTION

The manufacture of dry and semidry sausage is an important branch of the meat industry. In 1976, 281 million pounds of fermented dry and semidry sausage products were produced in federally inspected meat plants in the United States (USDA, 1976).

The total subject of sausage, or dry sausage and semidry sausage, of course, goes back to Europe where sausages of this type primarily developed. Shannon (1966) reported that the No. 1 product, the best sausage product manufactured in Europe, is primarily pure pork; and the No. 2 dry sausage is pork and beef. Shannon (1966) also reported that in Germany the pH of the ham is checked and pork carcasses with lower pH values are separated out as being the most ideal for the manufacture of fermented dry sausage.

It is well known that meat from pale, soft, exudative (PSE) pork has lower pH values (5.2-5.4), reduced water holding capacity, and that processing yields of products produced form this type of pork is lower than normal pork (Briskey, 1964; Merkel, 1971). Merkel (1971) also reported that TBA values (rancidity) were higher in PSE than normal pork. However, little published information is available concerning the use of PSE pork in the manufacture of dry sausage.

We conducted this study to evaluate some of the chemical, physical and processing properties of an all-pork fermented dry sausage prepared from PSE or normal quality pork as the only meat source.

MATERIALS AND METHODS

Lean meat and fat were obtained from fresh pork loins selected at a commercial packing plant. Loins were used to ensure a homogeneous starting raw material. Normal quality and PSE bone-in pork loins were selected on the basis of color, structure, firmness, and pH (normal, 5.9-6.0; PSE 5.5 and below) of the longissimus muscle 24 hours after slaughter. Lean meat and fat were physically separated from the bone, and the raw meat materials frozen to comply with regulations on pork to destroy trichinae.

We used an all-pork Genoa Salami formula. Lean and fat were separately ground once through a 1.6 cm. plate, thoroughly mixed, and the raw meat materials chopped in a silent cutter with the cure, salt, spices and lactic acid starter culture added according to the procedure of Komarik et al (1974). Starter culture was Lactacel MC (Merck and Co., Inc., Rahway, N. J.). The chopped sausage mixture was vacuum mixed for 1 min, and stuffed into 73 mm DS fibrous casings (Union Carbide) to about 1000 g. Sausage chubs were fermented at 38°C and 85% RH for 18 hrs, cooled to 13°C, placed in a drying room and dried for 35 days at 12.9°C and 70% RH with an air flow of 2-5 linear ft/min passing over the product.

Proximate composition and salt were determined by AOAC methods (AOAC, 1965). The pH of sample extract was measured with a Radiometer pH meter (Model 25) equipped with a single combination electrode. The 2-thiobarbituric acid test (TBA) (Tarladgis et al., 1960) was used to measure oxidative rancidity during the drying period. TBA values are reported as mg of malonaldehyde per 1000 g of sample. Percent weight loss or "shrinkage" of individual sausage chubs was determined after 2, 4, 7, 14, 21, 28, and 35 days of drying. Shear measurements were made with an Instron testing machine equipped with a multi-blade attachment. Sausage slices were 3mm thick. Shearing force was calculated as gms force/g sample/cm^2 surface area exposed to the shear blades.

RESULTS AND DISCUSSION

Initial pH values of the sausage mix containing PSE or normal quality pork differed significantly ($P<0.05$); 5.3 and 6.0, respectively (Fig. 1). During fermentation, the pH significantly ($P<0.05$) decreased to 4.5 for PSE pork and to 4.65 for normal quality pork, which remained essentially the same for the remainder of the 35-day drying period. The ultimate pH values were with the range that Acton and Dick (1976) published for fermented sausage, but are slightly lower than the pH of 4.89 that they reported for Genoa Salami. Although the initial pH was higher (6.0) for the mix with normal pork, than for the mix with PSE pork, the final pH values were essentially the same for both.

The TBA values of the ground PSE and normal pork (after 1 month of frozen storage to destroy trichinae) prior to sausage preparation were 0.32 and 0.14, respectively. These values are essentially the same as those reported by Kemp et al. (1976) for fresh PSE and normal pork loins. Merkel (1971) reported that in pork stored frozen for 3-4 months, TBA values were higher for PSE than for normal loins. However, Merkel (1971) did not determine the TBA values of any of the products prepared with PSE pork. Changes in TBA value during drying of fermented sausages are shown in Figure 2. Sausages prepared from PSE pork had significantly ($P<0.05$) higher TBA values than sausages prepared from normal pork.

We did not sensory evaluate quality of the sausage samples. Turner et al. (1954), however, concluded that pork with a TBA value below 0.30 would produce an acceptable weiner (60% regular pork and 40% cow meat), but pork with a TBA value of 0.55 or greater would not. TBA values suggest that the development of rancidity in products from PSE pork which has been frozen for varying times should be studied especially by sensory evaluation.

From weights of individual sausage chubs before and during the drying period, percentages of weight loss (shrinkage) were calculated and averaged (Table 1). During the first 4 days of drying, percent weight loss did not significantly differ between the two sausage groups; however, at 7 days and thereafter, the PSE sausage had significantly ($P<0.05$) more shrinkage at each interval than the normal sausage. Commercially, in the

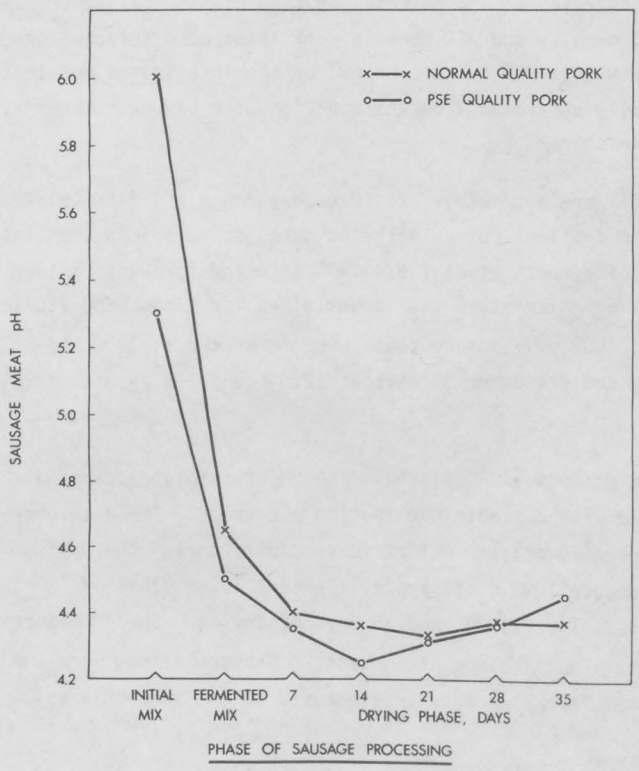

Fig. 1. Sausage pH at various phases of processing.

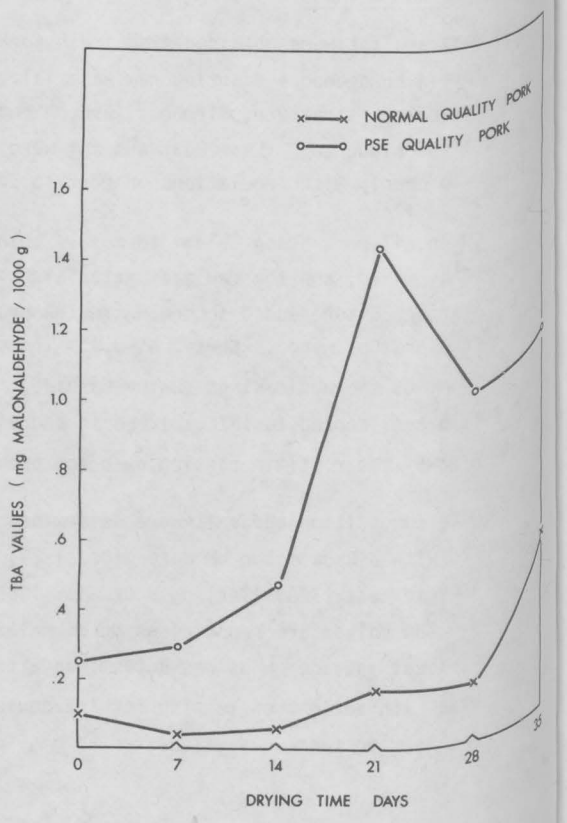

Fig. 2. Changes in TBA values of an all-pork Genoa salami during drying at 12.9°C and 70% relative humidity.

United States, the drying time under proper conditions depends upon the type of sausage being produced. Dryness is classified by two methods. Kramlich (1971) used approximate moisture content of sausages, while Wilson (1960) and Komarik et al. (1974) used a range of shrinkage values. Since sausage preparations vary in type of meat tissues and trimmings used, the shrinkage methods provide greater flexibility for dry sausage classification. Use of the shrinkage method, showed that the suasages containing PSE pork reached the semidry stage (20-25% shrinkage) after about 14 days and the medium dry state (30-35% shrinkage) after about 35 days of drying. In contrast, sausages containing normal quality pork required 21 days to reach the semidry stage and over 35 days to reach the medium dry stage. Neither of the two sausage groups reached the dry stage during 35 days of drying.

Table 1. Percent weight loss of sausage during drying[ab]

Sausage Group[c]	Days of drying						
	2	4	7	14	21	28	35
PSE	3.86[a]	7.73[b]	12.97[c]	21.91[d]	27.37[e]	30.93[ef]	33.48[f]
Normal	2.23[a]	5.03[a]	9.51[b]	16.77[c]	21.77[d]	25.46[e]	28.56[e]

[a]Means within each row having the same superscript letter are not different ($P<0.05$).

[b]Any two means underlined within a column are not different ($P<0.05$).

[c]PSE = Sausage prepared using only pale, soft, exudative pork as the meat source. Normal = Sausage prepared using only normal pork as the meat source.

Shear values at each drying interval (except 21 days) were significantly ($P<0.05$) lower for sausage containing PSE pork than for sausage containing normal quality pork (Table 2), however, shear values for both sausage groups significantly ($P<0.05$) increased with drying time. Since the moisture, fat and protein contents are essentially the same for the two sausage groups, the decrease in force required to shear the slices of fermented sausage containing PSE pork cannot be explained on moisture loss alone. We found no apparent relationship between moisture content and shear force at any one drying interval. Possibly the muscle fibers differ between the types of pork and influence the shearing characteristics. The relation between the characteristics of muscle fibers and fermented sausage are largely unknown and should be investigated.

Table 2. Shearing force (g/g - cm^2 of slices of fermented sausage)[ab]

Sausage Group[c]	Days of drying					
	0	7	14	21	28	35
PSE	31.2[a]	39.5[ab]	60.1[b]	94.6[c]	100.4[c]	131.8[d]
Normal	68.3[a]	86.6[ab]	110.5[bc]	118.8[c]	148.8[d]	186.6[e]

[a]Means within each row having the same superscript letter are not different ($P<0.05$).

[b]Any two means underlined within a column are not different ($P<0.05$).

[c]PSE = Sausage prepared using only pale, soft, exudative pork as the meat source. Normal = Sausage prepared using only normal pork as the meat source.

Results of our research on the use of PSE pork in dry sausage formulations would indicate that drying time can be shortened; however, there may be some problems with rancidity development and loss of texture (cohesion or bind). We plan to evaluate fermented dry sausages that contain varying proportions of PSE to normal pork.

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Ms. Sue E. Mescher, Mr. John Anderson and Mr. G. Barrett are acknowledged for their technical assistance with physical and chemical analyses.

References to brand or firm names does not constitute endorsement by the U. S. Department of Agriculture over others of a similar nature not mentioned.