RURAL INDUSTRIES
RESEARCH & DEVELOPMENT CORPORATION

A Manufacturer's Guide to

Venison Forequarter

A Report for RIRDC by

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"A Manufacturer's Guide to Venison Forequarter"

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FOREWORD

This report identifies food products and manufacturing processes that can help to commercially exploit venison forequarter and trim. It highlights how these often neglected parts are well suited to the growing convenience food niches such as hams, roasts, sausages, meatballs and others.

The report is an extensive manual for meat manufacturers with many recipes and valuable suggestions using successfully tested processing procedures.

It also provides explanations of the properties and textual characteristics of venison forequarter - indispensable technical information for industry managers and operators wanting to maximise domestic and export marketing opportunities.

The report forms part of RIRDC's deer research and development program, which aims to foster the growth of a viable Australian deer and deer products industry.

We hope you will find this a useful reference tool for your library.

PETER CORE
Managing Director
RIRDC

PREFACE

Production of deer for slaughter in commercial quantities is now a reality in Australia. However, in getting to that stage deer farmers have relied heavily on live animal sales for income, and marketing of venison has been largely opportunistic. With the introduction of levies in various sectors of the industry in 1993, and the contribution of Commonwealth funds via the RIRDC, that finance became available to support R & D into market development.

As part of the market development program the need for research and development of value added products from forequarter venison was recognised, and manufacturing details for a range of products form the basis of this report.

Venison from the forequarter makes up a considerable proportion of a carcase, and has proven troublesome for venison wholesalers to market. Furthermore, the value of forequarter meat is low, costly to store, and usually in low demand as a raw product. Various smallgoods products have been developed by individual venison wholesale groups in the past, and many of these are being successfully marketed. However, most of these formulations are carefully guarded by the manufacturer, and product consistency in many cases is not tested. Some snack food products such as meat pies also utilise surplus forequarter meat, and these too are successfully marketed.

It is clear from attempts to market venison differently that there is both scope and provisional market acceptance for a range of value added venison products. The industry is now at a critical stage, where market development will rely heavily on quality assurance to induce repeat buying of accepted products. There is no room in this or any other industry for product differences between batches, and the Australian deer industry is to be commended for developing strategies to ensure that this does not occur.

The range of products described in this manual is by no means comprehensive, but represents a number of different types of product that can be utilised in various food marketing sectors. To develop the products described it was necessary to determine and describe with accuracy the characteristics of venison.

Analysis of protein, fat content, pH, water holding capacity, toughness, muscle structure, and colour of meat, and characterisation of the various fatty acid components of deer fat, plus fat melting properties were determined. The product formulations presented in this manual are based on these analysis, and have been rigorously tested for repeatability.

The manual has been designed so that scale-up production for the various formulations could be achieved easily by following the flow charts provided, with the proviso that these charts may change slightly depending on the equipment available. There should be no need for further characterisation of the physical properties of venison.

While the suggested recipes and processing information is both accurate and feasible to the best of our knowledge, we cannot accept any responsibility or liability for product failure or lack of acceptance. The success of producing, launching and marketing a product is interdependent on various internal and external factors. Each of these factors varies according to capital investment, management, premises, equipment, and availability of technical skill.

Before attempting to produce any product style suggested in this manual, it is strongly recommended for each individual or organisation to consult the Australian Quarantine and Inspection Service (AQIS) of the Department of Primary Industries and Energy (DPIE), under the Quality Assured Food Orders Act to confirm resulations for Approved Quality Assurance (AQA). This is necessary, so that the appropriate way for implementation of quality and safety guidelines on raw materials specifications, processing and production line requirements can be employed.

The basic elements of a Quality Assurance (QA) plan are the same for all sections of the food industry although emphasis and details will vary from industry to industry. In all cases, the QA plan must comply with the legal requirements relating to that particular industry. Failure to comply with these quality system guidelines can increase the risk of product/process contamination and thus the safety of those who consume the product.

We believe that there are both domestic and export marketing opportunities for the products described. In particular, the convenience foods (finger foods) represent perhaps only the tip of the iceberg for marketing potential in a world increasingly geared towards purchasing prepared meals. This study has demonstrated that forequarter venison is both suitable and readily available

for manufacture of such products, and that product consistency is achievable. Large scale uptake of forequarter and trim may require industry pooling of this product, to make manufacture of various product lines economically feasible. The challenge is now with the deer industry to further develop the potential of these products.

Robert Mulley

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The following companies have provided significant assistance to this project:

* Davis Gelatine Pty Ltd
* Devro Pty Ltd
* Durant Food Services Pty Ltd
* Globus Pty Ltd
* Heimann Food Maker
* H J Langdon & Co Pty Ltd
* Kelco International
* National Starch & Chemical Pty Ltd
* New Food Coatings Pty Ltd
* Swift & Company Ltd

PART I

PHYSICO - CHEMICAL PROPERTIES OF VENISON AND DEER FAT

In order to develop successful restructured products, a fundamental understanding of the properties and textural characteristics of forequarter venison and trim required evaluation. This information formed the basis of developing suitable products from forequarter venison. During the deer industry Annual General Meeting (AGM 1994), queries were raised regarding the utilisation of deer fat, which in late summer was shown to contribute a significant proportion of the carcass trim. (Currently the under utilised deer fat also represents a significant financial loss).

Recent market research indicated that there is an upsurge in consumer acceptance of prepared foods, and also suggested that consumers are increasingly willing to pay for the value added portions of their purchase to free-up committed time and to add variety to their menu (Venison Market Development Plan 1992, ANNEX 7). It was further pointed out (ANNEX 8) that processed meat products require careful control of factors such as formulations, serving size, quality, price, packaging and distribution. There have been numerous attempts by independent venison wholesalers to manufacture and market a range of value added venison products as a result of the immediate need to utilise surplus forequarter meat. Most attempts have relied on current formulations and processing methods available for traditional meat processing with pork and beef, and the resulting products were of variable quality. It is evident that a systematic approach to the development of consumer acceptable value added forequarter venison products is necessary.

Literature searches to date have been unsuccessful in obtaining useful data on forequarter venison. The available data has been derived from characteristics of the whole carcass whereas the proposed value added products would be manufactured from the forequarter section primarily, but

also would be utilising trim meat. The variation in muscle functionality and textural characteristics could present a significant factor in the development of products and processes.

Study of the functional properties and textural characteristics of forequarter venison from Red (Cervus elaphus) and Fallow (Dama dama) deer

Analysis of physical and chemical properties of selected cuts of the forequarter were conducted. The experimental design was as follows :

1. To analysis the differences between the major forequarter cuts, such as chuck and shoulder.
2. To analyse the changes which occur during the aging process.

Analytical methods:

* Water Holding Capacity (WHC) by drip loss method (Honikel, 1988)
* Colour by L, a, b colour reflectance method (Minolta Chroma Meter)
* Texture by Warner Bratzler Shear press Instron method (Zhang & Mittal, 1993)
* pH by electronic pH meter
* Fat by Soxhlet method (AOAC, 1993)
* Protein by Kjeltec method (AOAC, 1993)
* Moisture by Oven drying method (AOAC, 1993)

Chemical Analysis

Table 1. Chemical analysis of Red and Fallow deer

	Fallow				Red	
	Male		Female		Male	
Test	**Chuck**	**Shoulder**	**Chuck**	**Shoulder**	**Chuck**	**Shoulder**
Fat(wet basis)	1.77	1.37	6.37	4.91	1.96	1.33
Protein(wet basis)	22.27	21.97	21.87	21.44	20.12	19.88
Moisture	74.56	76.29	75.18	74.64	76.43	76.51
pH	5.75	5.79	5.79	5.74	5.80	5.82

* Fat

The results indicated a significant variation in body fat between sexes. The fat content of female deer was shown to be nearly triple that of their male counterparts. The differences can be attributed to seasonal changes and hormonal differences in females. This large variation was considered significant when producing low fat products.

* Protein

The results obtained are slightly lower than published data derived from whole carcass studies (Mulley 1989, Gregson and Purchas 1985). A direct comparison was therefore not possible because none of the published data were obtained from chuck or shoulder cuts. The result shows that the protein content of Red deer was approximately 1% lower than the Fallow deer. These data were found to be in agreement with literature (Mulley 1989) which stated that variation in protein

composition of meat is primarily due to seasonal and hormonal changes, species, diet source, age, etc.

* Moisture

The meat was found to contain approximately 75 % moisture. There were no significant differences between sexes and species.

* pH

The post rigor pH value obtained ranged from 5.75 to 5.85.

Physical analysis of Red and Fallow deer

	After 14 days of Ageing	
	Fallow	**Red**
Colour - lightness	(+) 3 % ^{L}	(+) 4 % ^{L}
Texture-toughness	(-) 15 % ^{WB}	(-) 14 % ^{WB}
WHC-driploss	7 - 9 %	11 - 15 %

Note : (+) indicates an increase
(-) indicates a decrease
L indicates the degree of lightness/darkness of colours, based on L, a, b numerical method.
WB indicates the Warner Bratzler shear value

The data for Fallow and Red deer are presented as average values and on percentage basis for ease of interpreting. The ageing process was conducted by hanging the carcass (from the achilles tendon) in a chiller at 4°C for a specified period of 14 days.

* As the period of storage increases, the meat colour became darker and finally dull. There was a gradual decline in surface brightness with ageing time. This was clearly reflected through the decrease in lightness and saturation values from L, a and b measurements obtained with the Minolta colour meter.

* Tenderness was found to be proportional to the storage time. The longer the duration of aging the more severe the breakdown of tissue as a result of enzymatic and microbial attack. Although there was a substantial reduction in toughness and chewiness, the method of hanging carcasses at 4°C for longer than 7 days was not recommended for the following reasons:

1. Hanging in the chiller caused significant moisture loss and thus eventually reduced the carcass weight and final profitability.
2. As a result of severe moisture loss, case hardening of carcasses occurred. This was recognised by the appearance of an extremely dry outer layer. Approximately 1 - 1.5 cm of surface meat was found to be unacceptable for consumption.
3. The detection of off odours after 12 days of storage.

* The drip loss in Fallow deer was found to be lower than Red deer. The resulting difference probably reflects the variation in quantity of muscle tissues between species.

Study of the chemical characteristics of deer fat and pork fat

The experiment was designed to analyse the chemical differences between deer fat and pork fat.

Analytical methods :

* Lipid extraction from adipose tissue (Bligh & Dyer, 1959)
* Gas chromatography (Skoog, 1992)
* Iodine value (AOAC, 1993)
* Melting point - slip point (AOAC, 1993)

Table 3. Iodine value and melting point of deer fat and pork fat

	Deer fat	Pork fat
Melting point (^{0}C)	48 - 50	37 - 40
Iodine value (^{0}C)	23.8	64.2

The melting range of pork fat is between 37 - 40°C and deer fat between 48 - 50°C. This value indicates that pork fat will melt first before deer fat if both are heated at the same rate.

Table 3 shows that deer fat has an iodine value of 23.8 and pork fat of 64.2. Based on these values, it is evident that deer fat is at least twice as saturated as pork fat. More conclusive results on degree of saturation were obtained through gas chromatography. Deer fat with a higher melting point appears to be more solid than pork fat at the same temperature and condition. By correlating these values with the melting ranges, it can be seen that this result is indeed consistent.

Table 4. **Composition of the major unfractionated Fatty Acid Methyl Esters (FAMEs) of deer and pork adipose tissues**

Fatty Acid	Deer Fat (%)	Pork Fat (%)
C 12:0 (Lauric)	0.32	-
C 14:0 (Myristic)	6.63	1.28
C 16:0 (Palmitic)	30.23	21.19
C 18:0 (Stearic)	36.60	11.56
C 18:1 (Oleic)	17.55	42.90
C 18:2 (Linoleic)	1.20	14.16
C 18:3 (Linolenic)	0.54	1.28

The Gas Chromatography result shows that deer and pork fat are composed of mainly even numbered saturated fatty acids with carbon chain length from 12 to 18. Palmitic acid (C16:0), stearic acid (C18:0) and oleic acid (cis-C18:1) were observed to be the major component of both fats. Their average quantity are 30.23%, 36.60%, 17.55 % for deer fat and 21.19 %, 11.56% and 42.90 % for pork fat respectively.

The main difference between deer fat and pork fat is in the ratio of saturation/unsaturation. From the detected fatty acids composition, deer fat has approximately 3/4 of its fatty acids consisting of saturated palmitic and stearic. On the other hand, only 1/3 of the total fatty acid present are as saturated fatty acid in pork fat. The fatty acid analysis through gas chromatography correlates well with the melting point and iodine values obtained. The more saturated deer fat was found to have a higher melting point and was of solidified appearance at room temperature.

Recently, there have been numerous studies focusing on the relationship between dietary fat and heart disease. General findings revealed that cholesterol and saturated fats are presumed to raise the level of blood serum cholesterol, which in turn leads to the deposition of atherosclerotic plaques on the arterial walls. From a marketing and advertising point of view, the high level of saturation present in deer fat might serve as a hindrance for consumer acceptance.

However, this does not necessary mean that deer fat can not be utilised. Beef fat is also more saturated than pork fat, but it has always been used in the manufacture of many smallgoods products. Studies have shown that the main concern over heart disease is in the amount of saturated fat consumed by individuals. The level of consumption of saturated fat has been linked to the degree of susceptibility to heart disease. Therefore, we propose that further investigation should be directed into two areas; firstly to study the technical feasibility of incorporating deer fat into a designated product and secondly to derive the appropriate level of usage taking into consideration health risk, safety regulations and consumer acceptance.

Conclusion

Overall, there were only slight variations detected between cuts. Shoulder was determined to be leaner and to have a greater water holding capacity, whereas chuck had a relatively higher fat composition. No major difference in protein content was observed between selected cuts. The major differences detected between species were in protein content and drip loss (Ref: Table 1 and 2). The greater the drip loss, the poorer the water holding capacity. Poor water holding capacity results in loss of weight during

conditioning. This affects final product quality and generally is an unattractive feature when processing cooked products or packaging fresh meat for retail purposes. The water holding capacity of meat is also an important determinant in the ultimate yield of any processed meat product. The higher the water holding capacity of the meat, the higher the ultimate yield of the product.

From the results presented above, variation between species was indicated to be more important than variation between cuts in one species. However, this variation was tolerable and caused no major difficulties in further processing. Based on the results of drip loss, it was suggested that Fallow deer would be more suitable for cooked products, whereas Red deer is more appropriate for dry or intermediate moisture products in which the rapid loss of moisture during processing is desirable.

The result obtained using gas chromatography revealed that deer fat is more saturated than pork fat. These data were supported by iodine values and the melting range. Although, the high saturation value seemed to be a disadvantage, it is nonetheless too early to conclude the degree of acceptability of deer fat from this nutritional point of view. Due to insufficient information available currently, it is strongly recommended that further investigation of the behaviour of deer fat in manufactured products be continued. The characteristics of deer fat in an emulsion based product have been investigated by Fong (1995).

PART II

PRODUCT FORMULATIONS

AND

PROCESSING PROCEDURES

DRIED MEATS

The drying of meat is one of the oldest forms of preservation. Dried meat products are consumed in all countries of the world, for example Biltong in Africa, Pemmican in South America, Beef jerky of North America and Dendeng of South East Asia are just a few examples. Traditionally, the removal of water from foodstuffs was done by allowing them to dry in air or sometimes accelerated by the warmth of the sun. This nature dependent process is undoubtedly slow and can take days as a result of unpredictable weather changes. Relatively recent advances in drying techniques involve simultaneous application of heat and removal of moisture from foods. The most common procedure is through utilisation of heated air or heated surfaces built inside a drying chamber. An increase in air temperature or reduction in relative humidity causes water to evaporate from a wet surface more rapidly.

The presence of water in food has been considered as an important condition responsible for the growth of microorganisms. However, extensive studies have also shown that the total amount of water present is not the sole factor inhibiting the microbial activity. Another significant parameter influencing the stability of food is the state of water present in the product. Control of water status can be achieved through incorporation of salt and sugar. The addition of salt and/or sugar has been shown to reduce the water activity or available water in the products and hence significant extension of the shelf life of the product. Salt and sugar also contribute to mouthfeel and taste. The level used varies according to the

type of product and the target markets sensory perceptions of this product attribute.

The Australian Food Standard Code (1994) has stated that in order to be classified as dried meat, the water activity of the finished product shall not exceed 0.85 and the moisture content shall be less than 35 %. If considering the moisture content of fresh meat at approximately 75 %, then a weight reduction of approximately 40 % during the processing period is deemed necessary to meet these specification.

The reduction in weight and bulk of food inherently reduces transport and storage costs and in certain types of food, also provides a greater variety and convenience for the consumer. The consumption of dried meat has gradually evolved from main dish to snack food. As snack foods, dried meats can be served conveniently as " nibbles ", but can also be served on other occasions, such as at cocktail parties, etc. This changing trend brings unlimited opportunity to introduce new products. Venison, with its healthy and highly respected image undoubtedly will become a sought after product with immense export potential, provided a suitable marketing strategy is implemented. Due to the high acceptance of dried meats to Asian populations, there is real potential for a viable export market for dried venison products.

Note: Any drying process must be tailored to the manufacturers drying equipment. The time, temperatures and relative humidities given in this manual are only a guide and must be adjusted to meet the final product characteristics and product shelf life required by individual manufacturers.

DENDENG

Dendeng is a popular dried meat product from Indonesia. It is similar to jerky except dendeng is not cured. Preservation is typically obtained through a carefully balanced combination of spices, brown or palm sugar and reduced water contents. This combination gives the product its typical characteristic sweetness and unmistaken dark brownish colour. Dendeng can be eaten as a snack or as a side dish for main meals. Dendeng can be eaten in the dried form or lightly fried in oil to give it a rich flavour and mouthfeel.

Ingredients

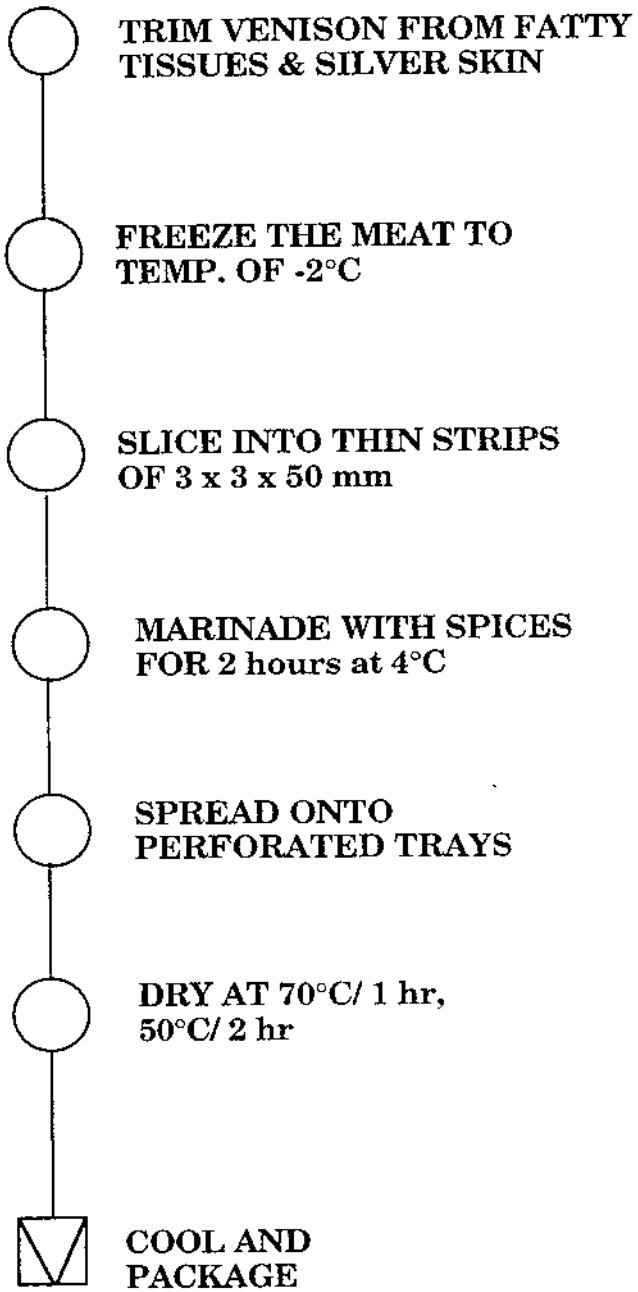
	Percentage (%)	1000 g
Venison forequarter	70.00	700.0
Palm or brown sugar	15.00	150.0
White sugar	3.50	35.0
Salt	2.85	28.5
Ascorbic acid	0.60	6.0
Coriander	3.90	39.0
Galanga	0.15	1.5
Crushed Garlic	0.50	5.0
Water	3.50	35.0

Procedure

1. Clean and trim meat from all fatty tissue, sinews and silver skin.
2. Freeze the forequarter cuts to a temperature of -2 to -4 ^{0}C. Freezing of the meat is necessary for obtaining thin and evenly cut slices.
3. Slice the partially frozen (tempered) meat into strips of 3 x 3 x 50 mm or fillets 3mm thick.
4. Marinade the meat with spices for 2 hours at 4 ^{0}C. It is important to keep the meat temperature as low as possible to avoid growth of microorganisms and development of off flavour.
5. Spread the marinated meat strips onto perforated trays for drying.
6. Drying process is carried out at 70^{0}C for 1 hr then followed by 50^{0}C for 2 hrs. A final moisture content of 15-20% and water activity of 0.50 to 0.60 in the final product is recommended.

7. After drying has been completed, the dried meat needs to be cooled to room temperature before packaging.
8. To prevent oxidation, it is recommended to use vacuum or modified atmosphere packaging.
9. Ideally packaging should be made from materials that are impermeable to light, oxygen, moisture and external flavour.

FLOW PROCESS CHART OF DENDENG



JERKY

A well known snack food for all occasions. This cured meat is characterised by its tough and chewy texture.

Ingredients

	Percentage (%)
Venison forequarter	97.70
Salt	2.00
Hi-cure	0.10
- Supplied by Heimann Food Maker Pty Ltd	
Black pepper	0.05
Garlic	0.05
Liquid smoke	0.10
- Supplied by Heimann Food Maker Pty Ltd	

Procedure

1. Remove fatty tissue and silver skin from venison forequarter.
2. Freeze the meat to a temperature of -2 to -4 ^{o}C.
3. Slice meat to 3 mm thickness.
4. Mix the meat slices with the rest of ingredients.

5. Cure overnight at temperature of 4^0C.
6. Meat should be spread out on perforated trays for drying.
7. Drying period is set at 70°C / 2 hr and then 50°C / 5 hr. A final moisture content of less than 15% is required in this product. (A weight loss of 65 to 80% in the product is considered normal during drying of Jerky).
8. Product has to be cooled down before packing.

FLOW PROCESS CHART OF JERKY

TRIM VENISON FROM FATTY TISSUES & SILVER SKIN

FREEZE THE MEAT TO TEMP. OF -2°C

SLICE THINLY
SIZE: THICKNESS 3 mm

MIX WITH NITRITE CURING SALT & OTHER SEASONINGS

CURE OVERNIGHT AT 4°C

SPREAD SLICES ONTO PERFORATED TRAYS

DRY AT 70°C FOR 2 hrs, 50°C for 5 hrs

COOL AND PACKAGE

SMALLGOODS

The smallgoods industry has a long history in both Western and Eastern society. Beef and pork are the two most common meats that were used to produce a range of hams and sausages. The production of sausages from liver and blood goes back to the Roman Empire, whereas dry sausages were introduced at least 2000 years ago. An increase in product range is usually obtained through a small variation in seasoning, chopping texture and meat composition. Today, production of smallgoods is more a way of serving than a way of preserving the meat.

The considerable growth in the Australian deer industry together with an indifferent market popularity for venison has become a concern to the venison processors. The hard to sell forequarter and trim meat cause significantly lower final profit from carcasses. Utilisation of these stocks of meat has been limited and new product development has rarely been successful in the past. With the growing demand for more new products, smallgoods is certainly an area of interest for the deer industry, since the smallgoods industry has proven to be a profitable line for other red meat processors.

There are a few classifications commonly used for the smallgoods range. In this report however, for ease of understanding, the products have been classified into two major groups; the whole muscle products, such as hams, and the comminuted and manufactured meats, which include the wide range of sausages currently available.

WHOLE MUSCLE CURED MEAT

The most well known name that governs this group is ham. Although, many types of hams are available on the market, they all are manufactured through the same basic procedure, which is curing. Over the years, the curing process has been greatly shortened and refined. The curing methods currently employed are dry curing and pickle curing.

In dry curing, meat is rubbed with dry salt and tightly packed. The meat is slowly cured and water is drawn out though an osmosis process which normally takes months. Pickle curing is when the meat pieces are injected and then covered with the brine for a specific period of time. The condition and the length of the curing process together with the addition of spices will determine the final product quality, such as product yield, texture, flavour, mouthfeel and colour.

With its mild gamey flavour, venison ham is certainly a delicacy of its own. Venison forequarter has been shown to consist of large amounts of silver skin and connective tissues. From visual inspection of the forequarter, it was found that the major cut that is most suitable for ham production is the shoulder section, which contains lesser amounts of silver skin and other connective tissues. On the other hand. Chuck is more suitable for comminuted products in which the silver skin and connective tissues can be broken down due to the particle size reduction in the restructuring process.

COMMINUTED AND MANUFACTURED MEATS

Sausages are one of the oldest forms of processed food. Meat, blood, offal and other ingredients were filled into gut casings and generally referred to as sausages. These were known to have existed prior to Roman times. The word sausage was derived from the Latin word "Salsus", meaning salted and consequently preserved meat. Basically all sausages are comminuted meat products. The meat structure is changed to suit the type of sausage to be made. The processing methods used are varied so as to give a definite character to different types of sausage produced. Success in the sausage business is reliant on a good knowledge and understanding of sausage manufacturing processes. There are a large number of sausages and ready to serve meats on the market, hence a simple method of identification must be used.

The meat formula cannot be used for the purpose of classification. Most sausage contains a combination of similar meats, either pork and beef, mutton or veal. The percentage changes only due to personal taste and/or the cost of the raw material. No classification can be based on the spice formula as basic spices are used in most products and even experienced people are unable to identify with certainty the spices or herbs used in some products. However, most sausage can be positively identified and classified by the manner of processing, types of casings used and the manner in which they are tied or linked.

Types of sausages:

1. Fresh sausage. This type is generally grilled, fried, oven cooked or in some cases cooked in water prior to consumption. They are uncured

and uncooked, which classifies them as perishable products which have relatively short shelf life.

2. Cooked sausage. These are pre-cooked, ready for consumption and usually no further cooking is necessary although in a few cases they may be subjected to some degree of immediate heating prior to consumption.
3. Dry sausage. This is generally intended for consumption without cooking. Although in some cases relatively high temperatures are used during the smoking process. Dry sausage is usually prepared from various cured meats, filled into casings and then dried under controlled conditions. Some types are also smoked.

The Australian Food Standards Code (March, 1995) states that products that are classified as sausage meat are fresh sausage and rissole. Sausage meat was defined as meat that has been subjected to mincing or comminution and mixed with flour or any form of plant proteins in which that the protein content of the meal does not exceed 28 %. The standard stated that sausage meat shall contain not less than 75% of meat, calculated on a fat free basis. Furthermore, the fat content of sausage meat must not exceed one half of the fat free meat flesh content. In order to preserve the desirable pinkish meat colour, the addition of sulphur dioxide (SO_2) into sausage mixture is allowed but in a proportion not exceeding 0.5 parts per million (ppm).

Other ingredients that can be included in the sausage meat mixture and have no specified limit are herbs and spices, salt, MSG, water, phosphates and smoke flavour. The incorporation of these ingredients has to be monitored carefully so that to achieve maximum profitability without sacrificing in product stability and product quality.

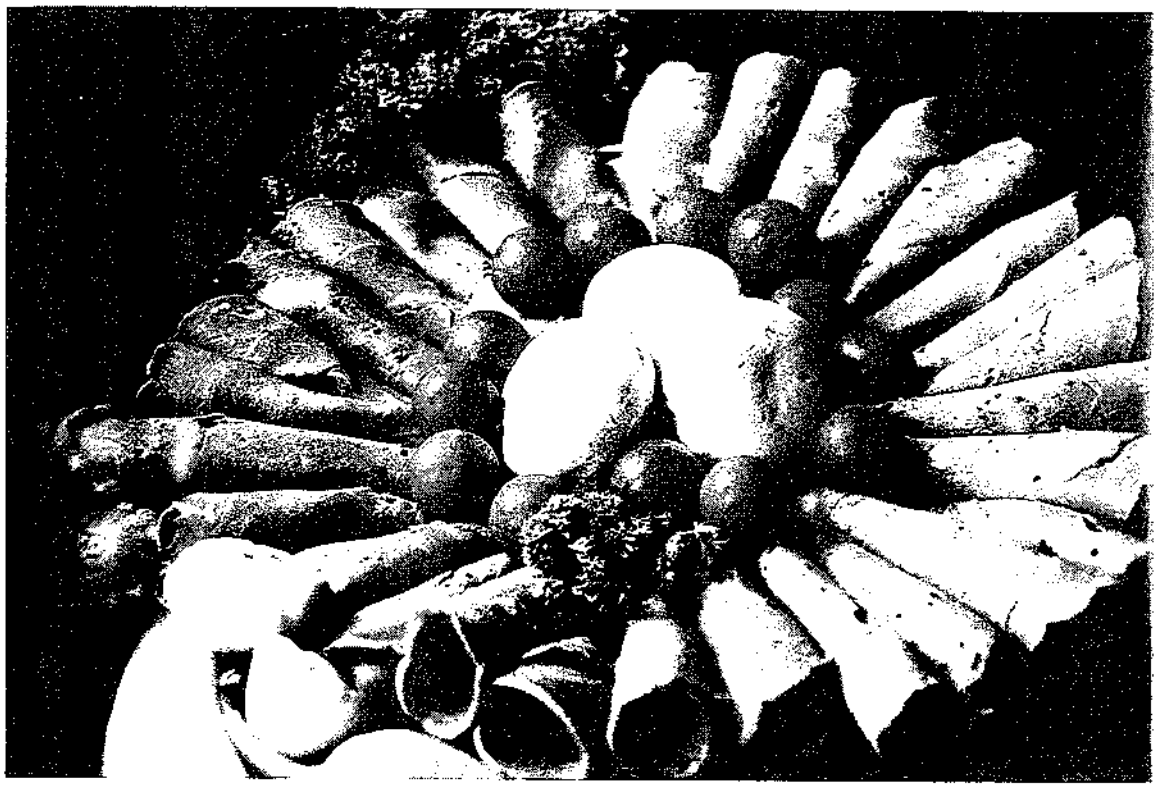
On the other hand, cooked sausages are considered as manufactured meat. This includes products described as frankfurters, devon, strassburg, salami, brawn, etc. Manufactured meat is known as products prepared from meat that has been subjected to mincing, chopping, flaking or comminution. The main specifications that govern the manufactured meat group is that the meat content of manufactured meat should not be less than 66%.

Manufactured meat can be sold under cooked or uncooked condition. The product is permitted to contain the following ingredients; herbs and spices, salt, sugar, vinegar, edible fats and oils, flavourings, gelatine and starter cultures. Strict specification is only applicable for the incorporation of sodium nitrite, sodium nitrate, gluconodeltalactone, vegetable gums, sulphur dioxide and citric / lactic acid.

Sodium nitrate and sodium nitrite are commonly added for curing purposes. The maximum limit set by the Australian Food Standards Code (March, 1995) for sodium nitrite is 125 ppm, calculated in the finished product. In the case of uncooked fermented manufactured meat (ie: salami), the maximum detected level for sodium nitrate in finished product is 500 ppm.

SOCCERBALL HAM

With its unique and original flavour, venison soccerball ham will definitely set its own trademark. The natural dark pinkish colour gives the product a distinctive product identity. Venison soccerball ham can be served as cold meat during formal occasions or simply for lunch sandwiches.



Ingredients

Venison

Premix - pickle curing

- 5 kg to 45 L water - according to supplier's instruction
- Supplied by Heimann Food Maker Pty Ltd

Salt

- Additional salt can be added according to taste. (Consideration of pump level must be noted when modifying a curing ingredient).

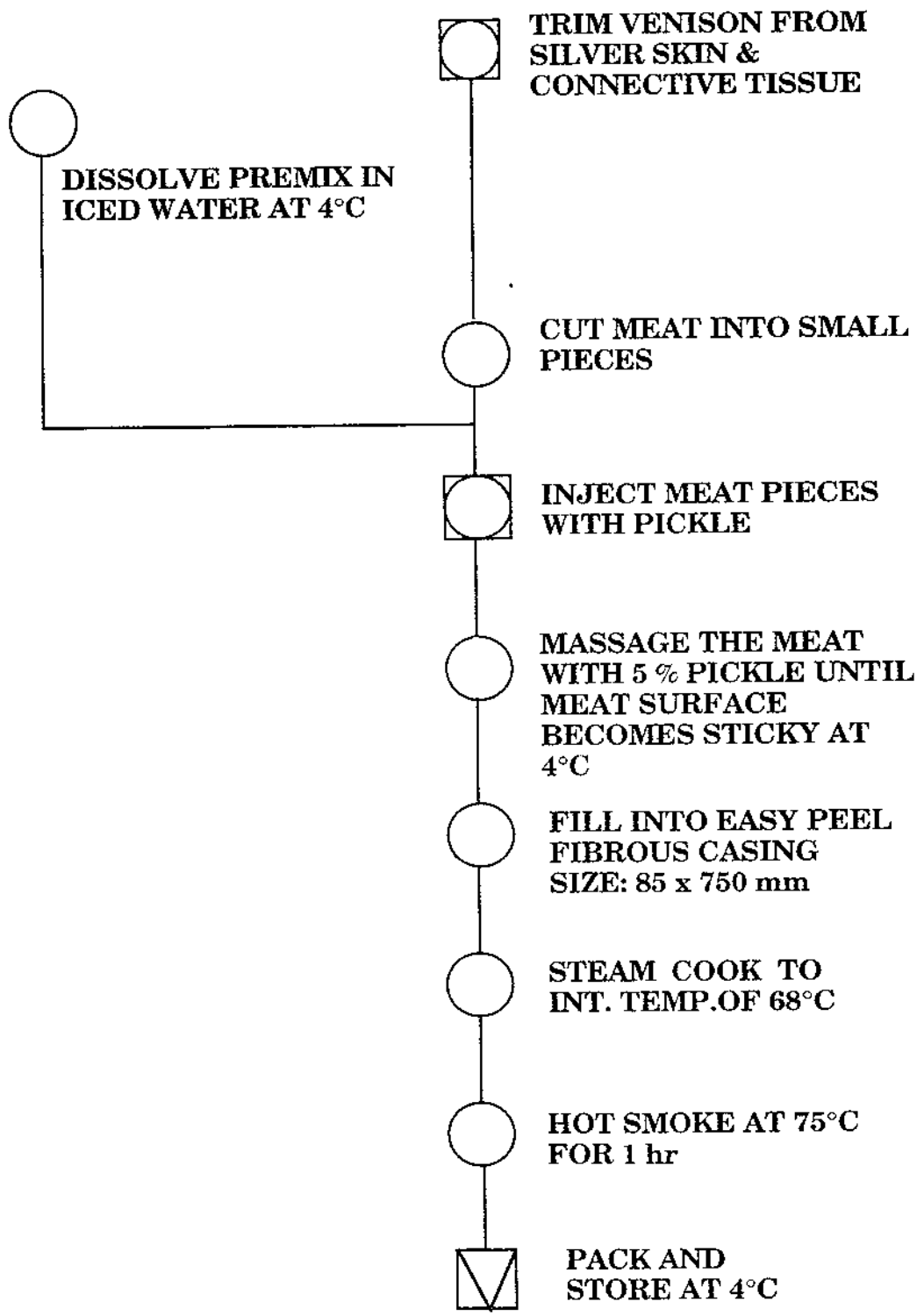
Ice

Procedure

1. Always use fresh meat for this type of product. Thawed meat is not recommended due to high drip loss and thus causes a lower water holding capacity and ultimately a lower product yield.
2. The first step is to trim the forequarter cuts from fatty tissue, sinew and silver skin.
3. Then prepare the pumping brine by dissolving the premix consisting of curing salt in the iced water. (Care must be taken that all ingredients are dissolved).
4. Increase the surface area of the muscles by means of cutting the meat into smaller pieces. The size of meat pieces can be varied according to manufacturer's specification.
5. Inject muscles with brine to an increase weight of 25 %.
6. Add meat and brine into the tumbler and evacuate the air until a vacuum of approximately 90% is achieved
7. The meat is then massaged for approximately 12 hours or until the meat surface becomes sticky.

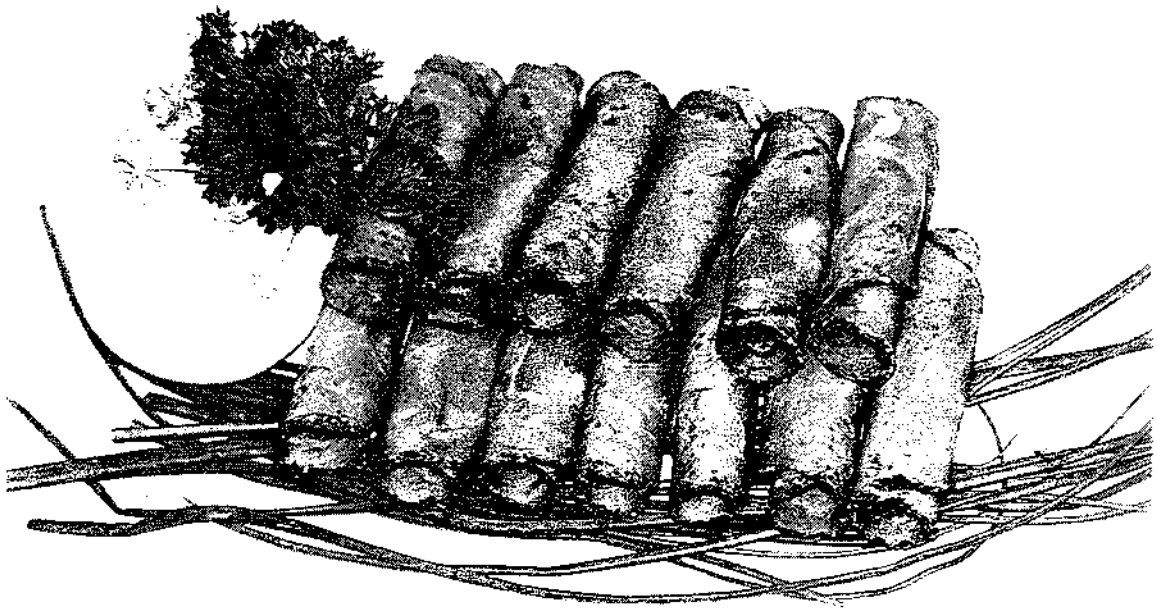
8. After massaging, fill the muscle pieces into 85 x 750 mm fibrous casing. The recommended casing is Easy Peel fibrous casing supplied by Globus Pty Ltd.
9. The product is steam cooked to an internal temperature of 68 ^{0}C and then followed by an hour of hot smoke.
10. Cool the product by means of water and store in chiller at 4 ^{0}C.

FLOW PROCESS CHART OF SOCCERBALL HAM



ROAST

The slight hint of smoky flavour gives the venison roast an exclusive characteristic. With a touch of herbs and spices, this product will serve as an attractive and excellent cold platter in any cocktail party.



Ingredients

Venison shoulder

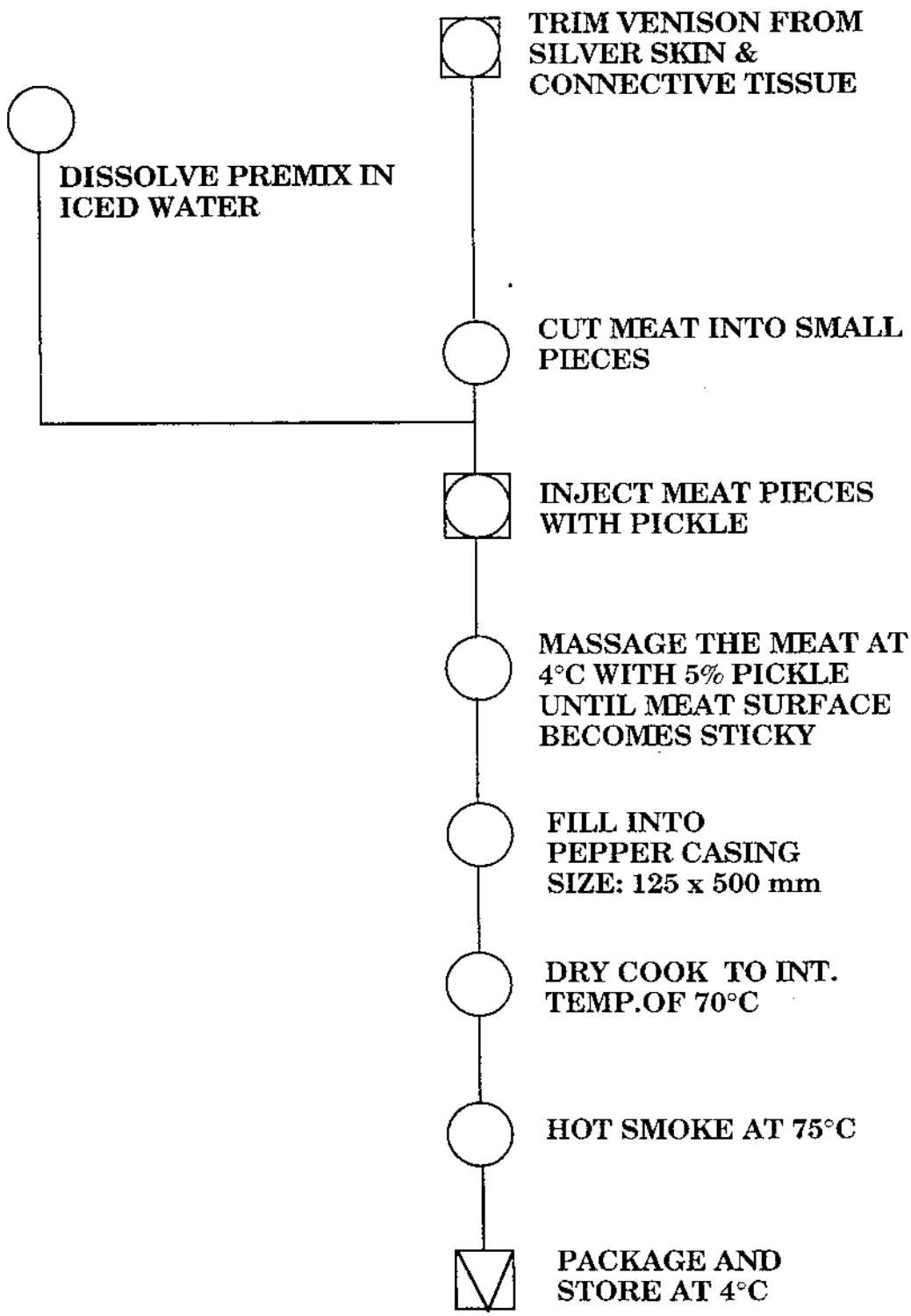
Roast pork brine mix

- 5 kg to 45 L water (supplier's specification)
- Supplied by Heimann Food Maker Pty Ltd.

Procedure

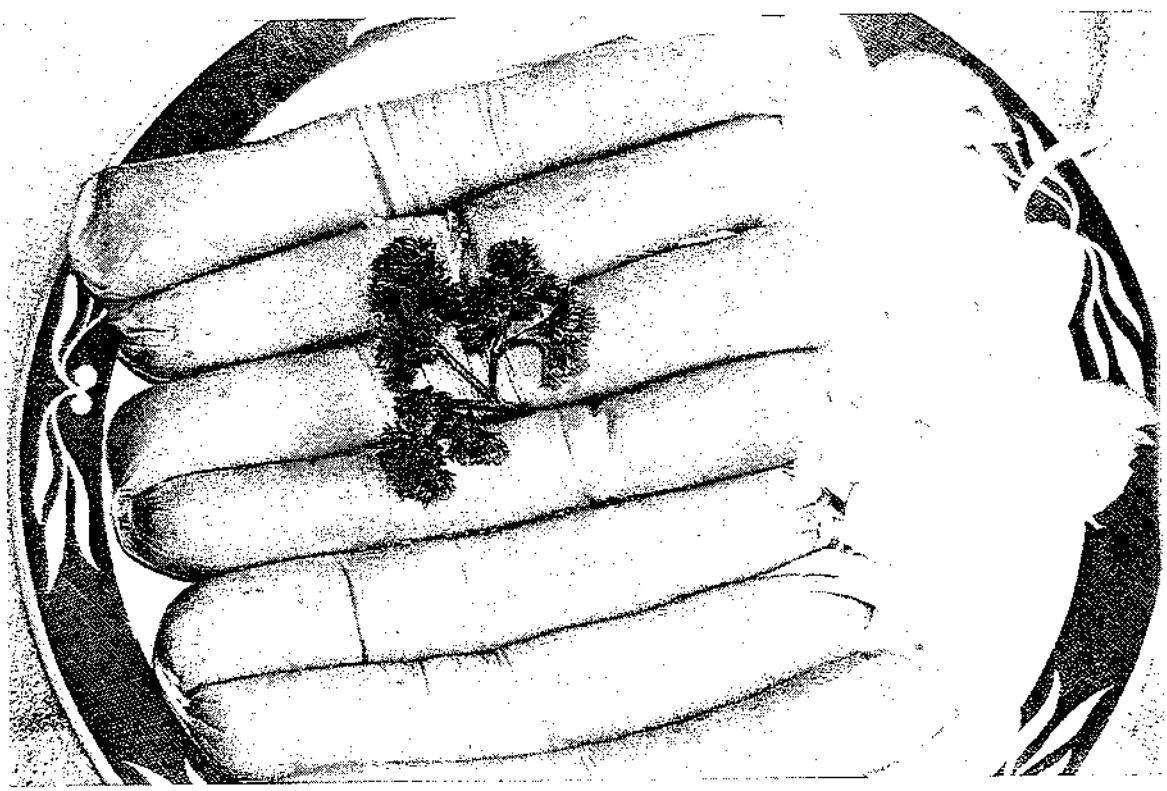
1. Always use fresh meat for this type of product. Thawed meat is not recommended due to high drip loss and thus causes lower water holding capacity.
2. The first step is to clean and trim the forequarter cuts from fatty tissue and silver skin.
3. Then dissolve the premix consisting of curing salt in the iced water.
4. Increase the surface area of the muscles by means of cutting the meat into smaller pieces of approximately 2 x 1 x 7.5 cm. The size of meat pieces can be varied depending on manufacturer's specification.
5. Inject muscles with brine to an increase weight gain of 25 %.
6. Add meat and brine (5 % of green weight) into the massager and evacuate the air until a vacuum of approximately 90% is achieved.
7. The meat is massaged for approximately 12 hours or until the meat surface becomes sticky.
8. After massaging, fill the muscle pieces into 125 x 500 mm pepper casing. This particular type of casing was supplied by Globus Pty Ltd.
9. The product is dry cooked to an internal temperature of 70 ^{0}C and then followed by an hour of hot smoke at 75 ^{0}C.
10. Immediately after the heat treatment, cool the roast in the chiller and then peel off the casing to reveal the outer layer of the pepper coating.
11. The finished product is then vacuum packed.

FLOW PROCESS CHART OF ROAST



FRESH SAUSAGE

Todate, fresh sausage has become a popular part of the Australian's diet. It is considered as the ultimate necessity for a typical Australian summer barbecue. The large consumption of sausages in this country and overseas brings unlimited opportunity to explore and introduce new varieties. A well balanced combination of herbs and spices gives venison sausage an interesting taste and flavour.



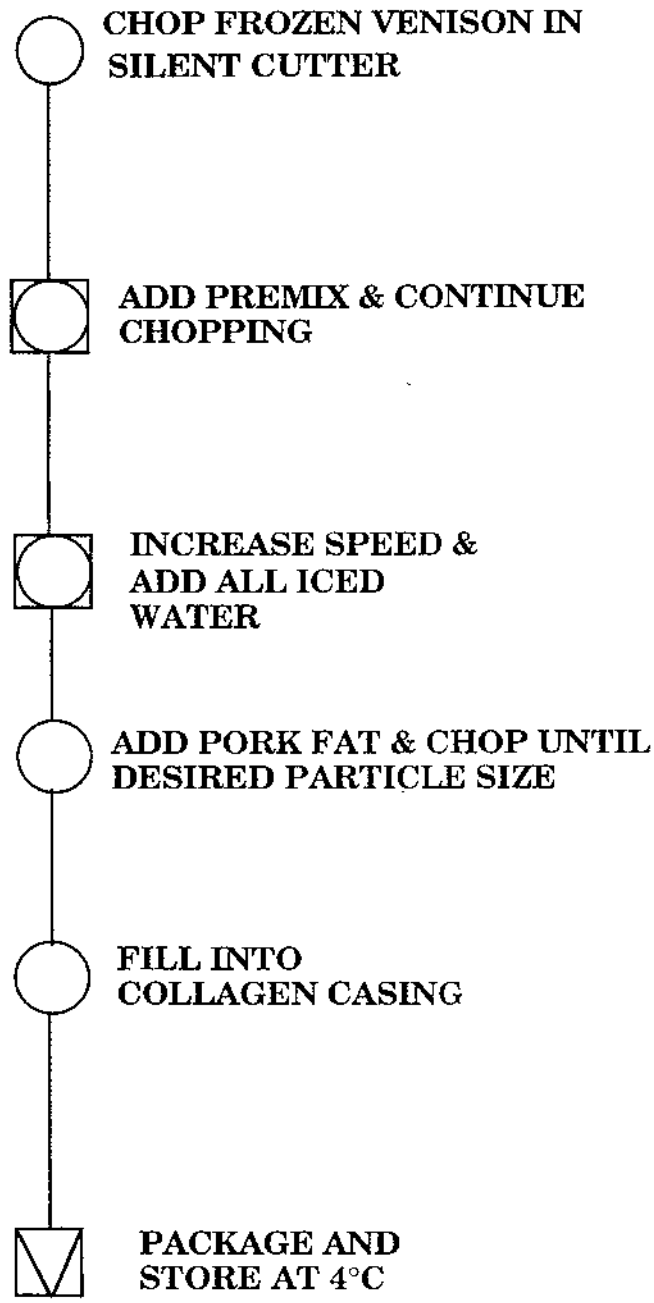
Ingredients:

	Percentage (%)	1000 g
Venison forequarter	50	500
Pork back fat	25	250
Complete seasoning meal for sausages (pork style) - Supplied by Durant Food Services Pty Ltd	7	70
Iced water	18	180

Procedure:

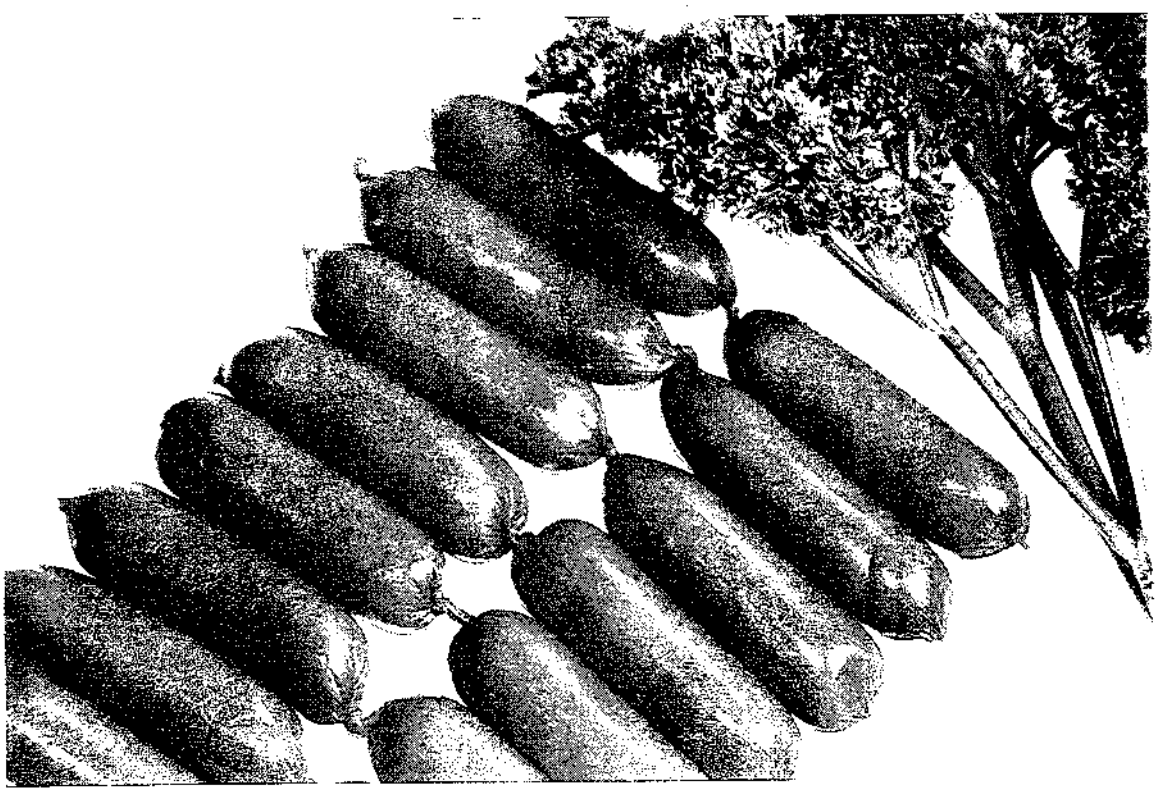
1. Place the frozen venison pieces into a silent cutter and chop the mixture on slow speed for a few rounds.
2. Add premix and chop until thoroughly blended.
3. Then add all the iced water at once.
4. Increase speed and chop to a paste forms.
5. Add tempered pork back fat and chop until desired particle size is obtained.
6. Fill the sausage mixture into 17(thin sausage) or 30(thick) mm diameter collagen or natural casing. The recommended casing for Fresh sausage 17-4106-19 (thin) or 30-4104 (thick) supplied by DEVRO Pty Ltd.
7. Keep the sausages under chilled condition (4^0C).

FLOW PROCESS CHART OF FRESH SAUSAGE



VIENNA SAUSAGE

Vienna sausage has served as a very popular snack around the world. The strong flavour and fine texture provide ultimate appeal to the consumer. This small diameter sausage is extremely popular for its juiciness and firmness. The length ranges from cocktail to hot dog size.



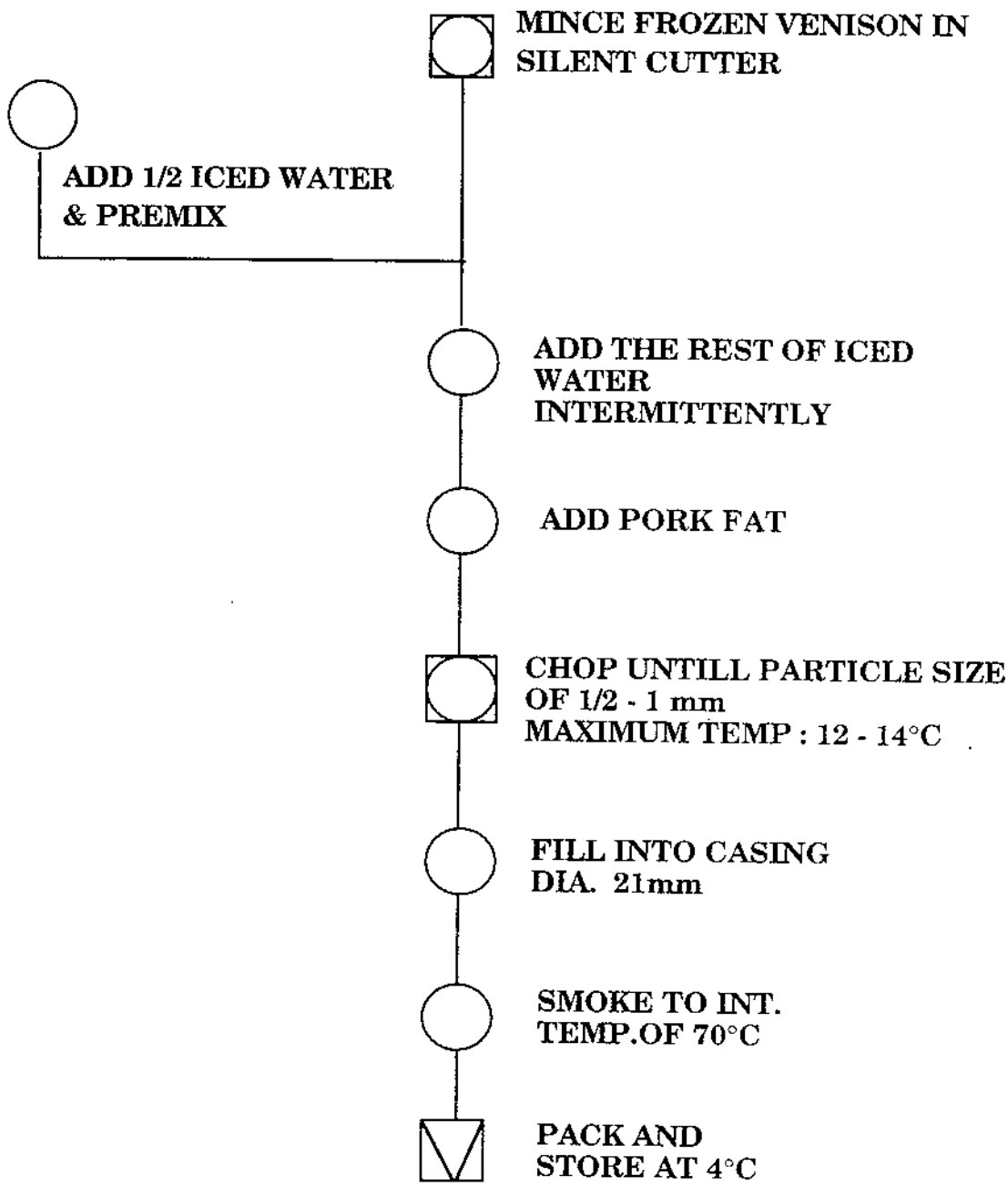
Ingredients

	Percentage (%)	1000 g
Venison forequarter	42	420
Pork fat	28	280
Iced Water	22	220
Vienna Gold premix	6	60
- Supplied by Heimann Pty Ltd		
Potato starch	2	22

Procedure

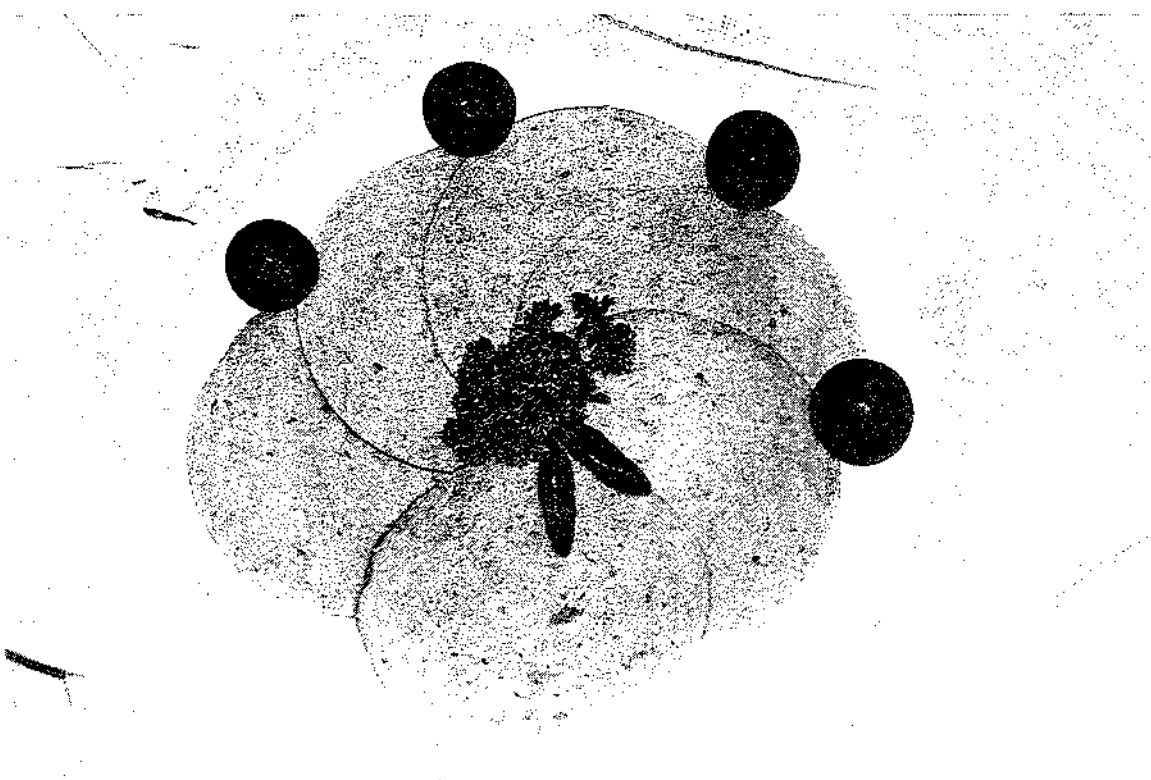
1. Well chilled meat or preferably frozen meat is used for this product.
2. Place the tempered venison pieces into silent cutter with half of the iced water and premix. Chop the mixture on high setting for a few rounds until the meat shows binding.
3. During this chopping period, iced water is added gradually to keep the temperature down.
4. After the particle size has been reduced substantially, add pork back fat and chop until particle size of 1/2 - 1 mm is obtained.
5. The final mixture should be very fine but do not over chop until temperature exceeds 12 - 14 °C.
6. Fill the mixture into 21 mm diameter collagen casing. The recommended casing is Frank Red 21-7725, supplied by DEVRO Pty Ltd.
7. Steam cook in smoke house to an internal temperature of 70°C.
8. Remove the product from smoke house and cool thoroughly before vacuum packaging.

FLOW PROCESS CHART OF VIENNA SAUSAGE



BOLOGNA

The firm and fine texture of this cooked sausage is the ultimate appeal for consumers. The taste can be varied according to the manufacturer. A common variation is by adding green peppercorns, which contribute to the product flavour and appearance.



Ingredients

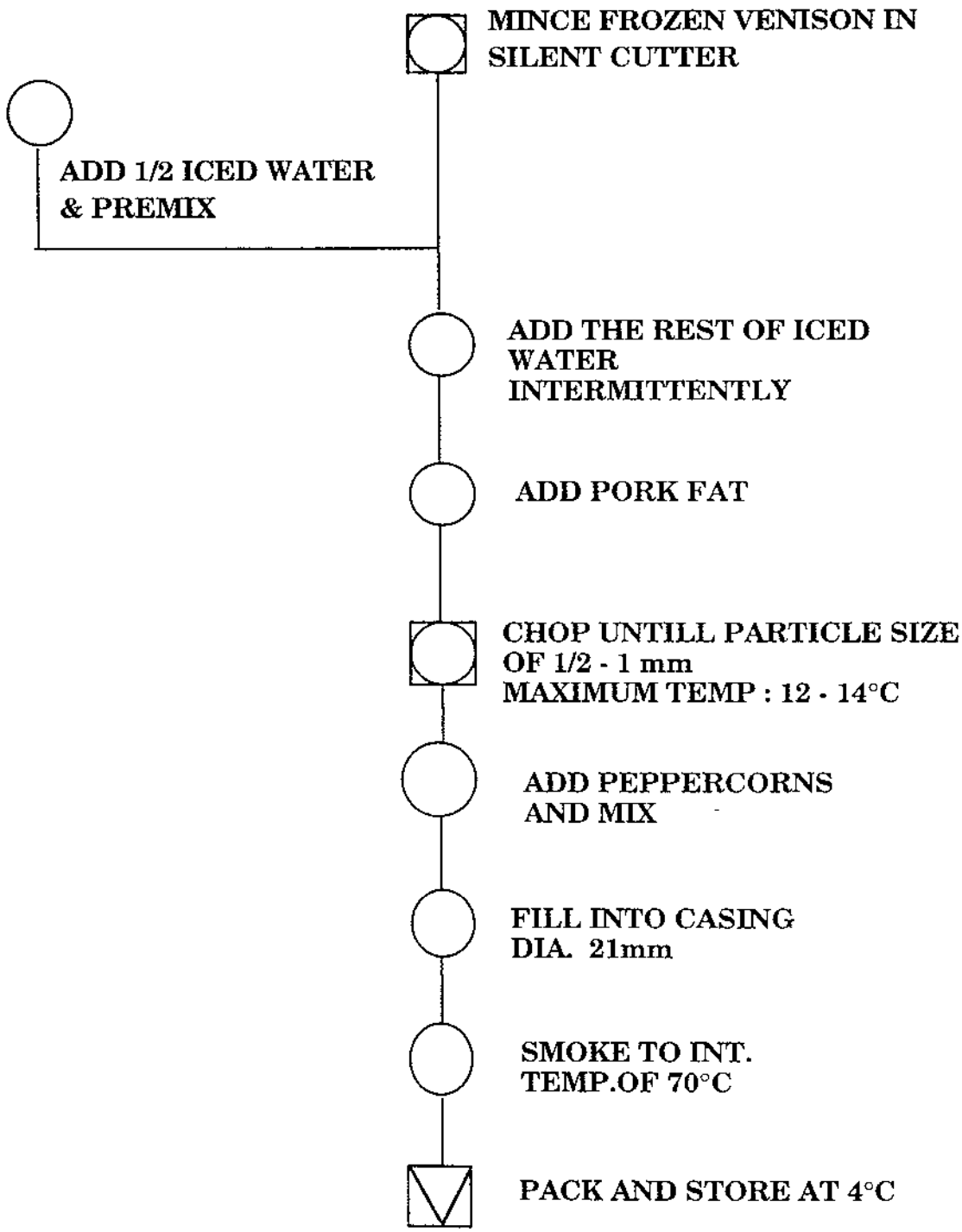
	Percentage (%)
Venison forequarter	43
Pork back fat	25
Cabana premix	6
- Supplied by Heimann Pty Ltd	
Garlic liquid seasoning	0.5
- Supplied by Heimann Pty Ltd.	
Iced water	22
Potato starch	2.5
Green peppercorns	1

Procedure

1. The meat used can be either in a fresh or frozen condition. If fresh meat is used then the meat has to be tempered to 0 - 2 ^{0}C. If frozen meat is used, then size reduction is necessary before processing commenced. Size reduction can be done by means of band saw, hydral-flaker, etc.
2. Place the tempered venison pieces into the silent cutter with half of the iced water and premix. Chop the mixture on high setting until the particle size is reduced to approximately 3 mm.
3. During this chopping period, iced water is added gradually to keep the temperature low.
4. The next step is to add chilled back fat and continue chopping until a very smooth mixture is obtained.
5. Mix the peppercorns into the sausage mixture by hands.
6. The final mixture should be very fine but do not over chop until temperature exceeds 12 - 14 ^{0}C.

7. Fill the mixture into 21 mm diameter collagen casing. The recommended casing is Frank Red 21-7725, supplied by DEVRO Pty Ltd.
8. Steam cook in smoke house to an internal temperature of 70^0C.
9. Remove the product from smoke house and cool thoroughly before vacuum packaged.

FLOW PROCESS CHART OF BOLOGNA



BEERWURST

This is a well known German product. The mild gamey flavour of venison combined with a distinctive smoky flavour produces a deliciously desirable product. The large proportion of cured meat gives a tender bite and a stunningly attractive cured colour.

Ingredients

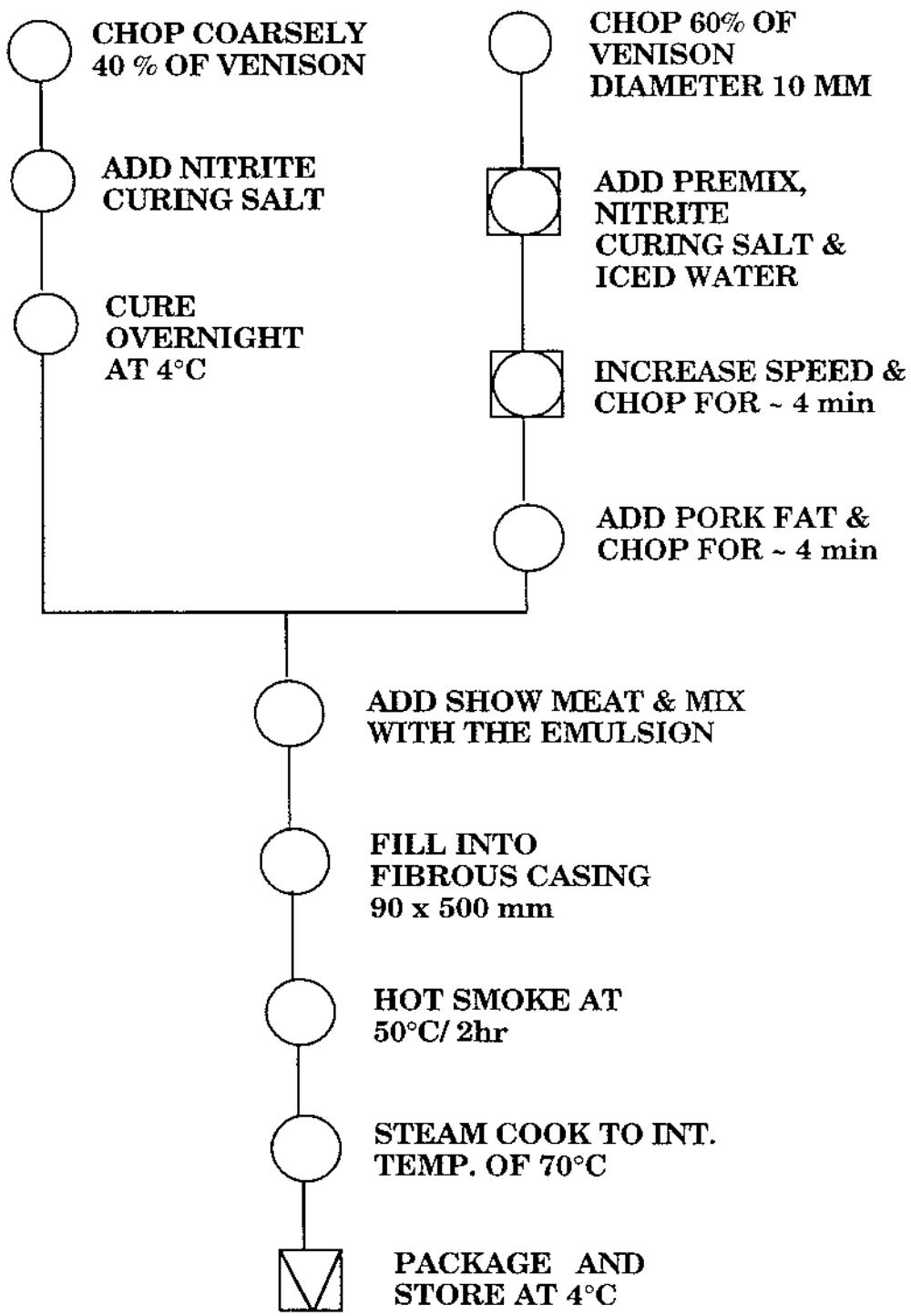
	Percentage (%)	1000 g
Venison forequarter	57.6	576
Pork fat	20	200
Nitrite curing salt	0.4	4
Cabana premix	6	60
- Supplied by Heimann Food Maker Pty Ltd.		
Ice water	16	160

Procedure

1. The day before, mix seasoning, salt and cure with 40 % of venison, cover the mixture and place in the chiller overnight for aromatising purposes. This is known as the show meat.
2. On the processing day itself, mince the cured venison through a large diameter mincer plate (e.g. 10mm).
3. Then place the rest of the venison in a bowl cutter and begin chopping.
4. During this chopping period, nitrite curing salt, iced water and premix are added gradually to keep the temperature cool and more importantly to solubilise the myosin. Chop the mixture on high setting for about 4 minutes.
5. The next step is to add partially frozen pork back fat and chop for another 4-5 minutes. It is essential to keep the fat in a frozen state in order to prevent fat smearing during chopping and also minimise the risk of fat rendering in the cooking process.
6. After the particle size of the meat has been reduced substantially add the show meat and chop for a few rounds only for even distribution.

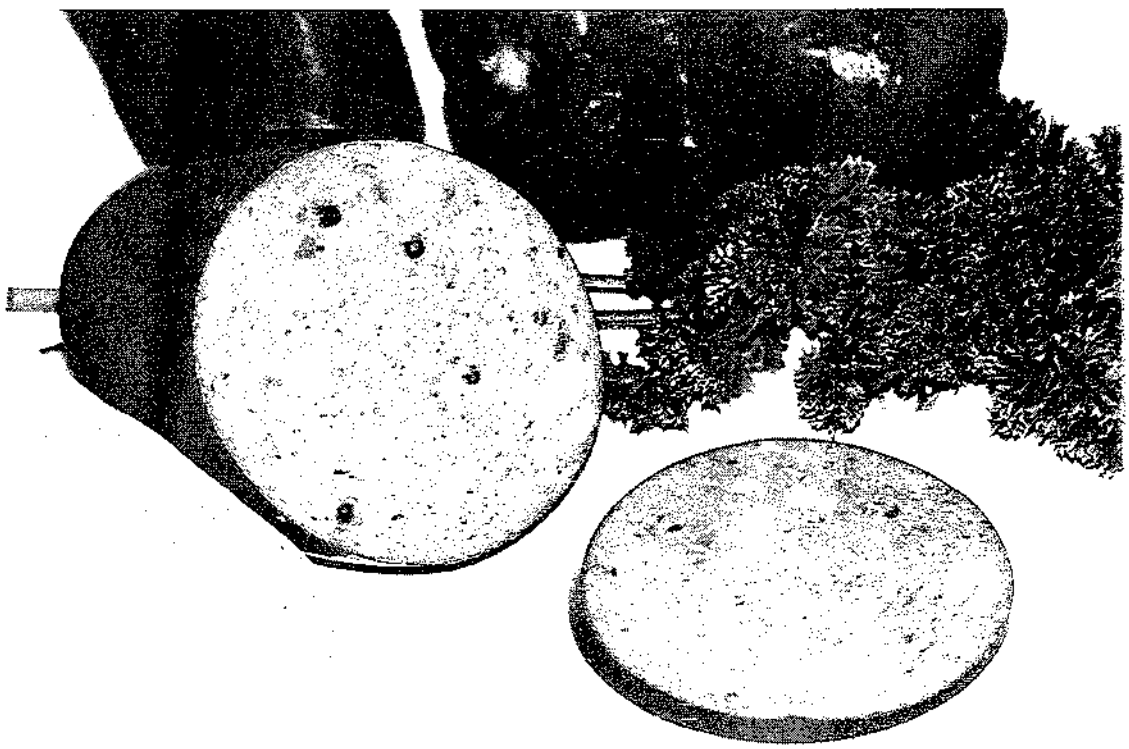
7. Do not over chop the mixture. Final temperature should not exceed 12 ^{0}C.
8. Fill the mixture into presoaked 90 x 500 mm fibrous clear top tied casing. The recommended casing is supplied by Globus Pty Ltd.
9. Hot smoke at 50 ^{0}C for 2 hours and at the same time allowing the product to develop its characteristic cured meat colour.
10. Steam cook the product until an internal temperature of 70 ^{0}C is reached.
11. Remove the product from the smoke house and cool thoroughly before vacuum packaging.

FLOW PROCESS CHART OF BEERWURST



MORTADELLA

The popular mortadella is characterised by the incorporation of tender and chewy small fat pieces. Venison mortadella will give a more pronounce colour difference between the meat and the show fat as a result of venison being a naturally darker coloured meat.



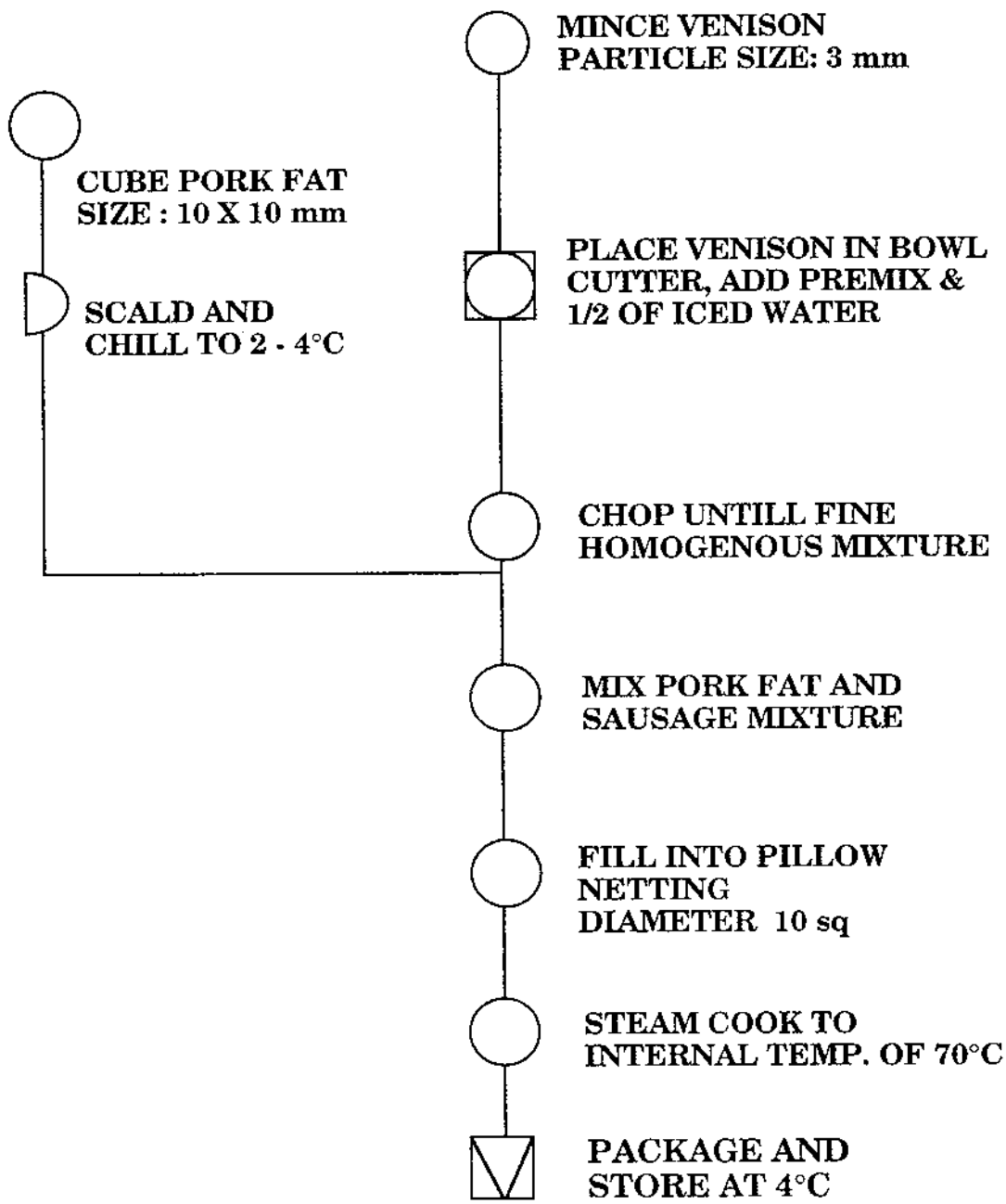
Ingredients

	Percentage (%)	1000 g
Venison forequarter	48	480
Pork back fat	27	270
Mortadella premix	7	70
- Supplied by Heimann Food Maker Pty Ltd		
Ice water	18	180

Procedure

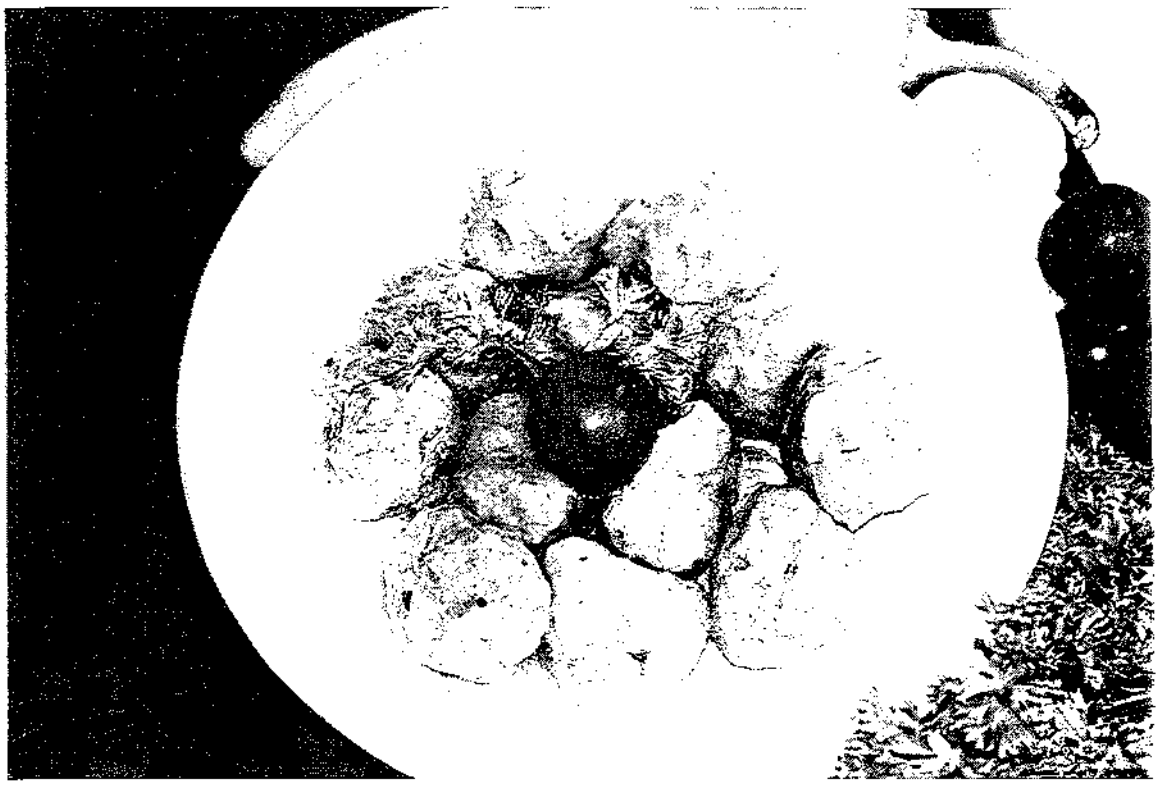
1. Pork fat is cubed, approximately 10 x 10 mm cubes.
2. Scald backfat cubes with hot water, drain properly and chill the fat to 2 - 4 ^{0}C.
3. Mince all the venison through the 3 mm plate.
4. Place the venison in the bowl cutter with premix and half of the iced water.
5. Chop to a fine homogenous sausage mixture.
6. Mix the back fat cubes into the sausage mixture (in mixer).
7. Fill mortadella mixture into 10 sq Pillow netting. This type of netting is supplied by Globus Pty Ltd.
8. Smoke at a temperature of 85 to 90^{0} C.

FLOW PROCESS CHART OF MORTADELLA



MEATBALLS

Meatballs have always been a popular food with the Asian community and now are slowly gaining an acceptance in Western society. The main distinctive and attractive feature of the meatball is its soft and chewy texture. Meatballs can be served with dips or many popular Asian noodle soups.



Ingredients

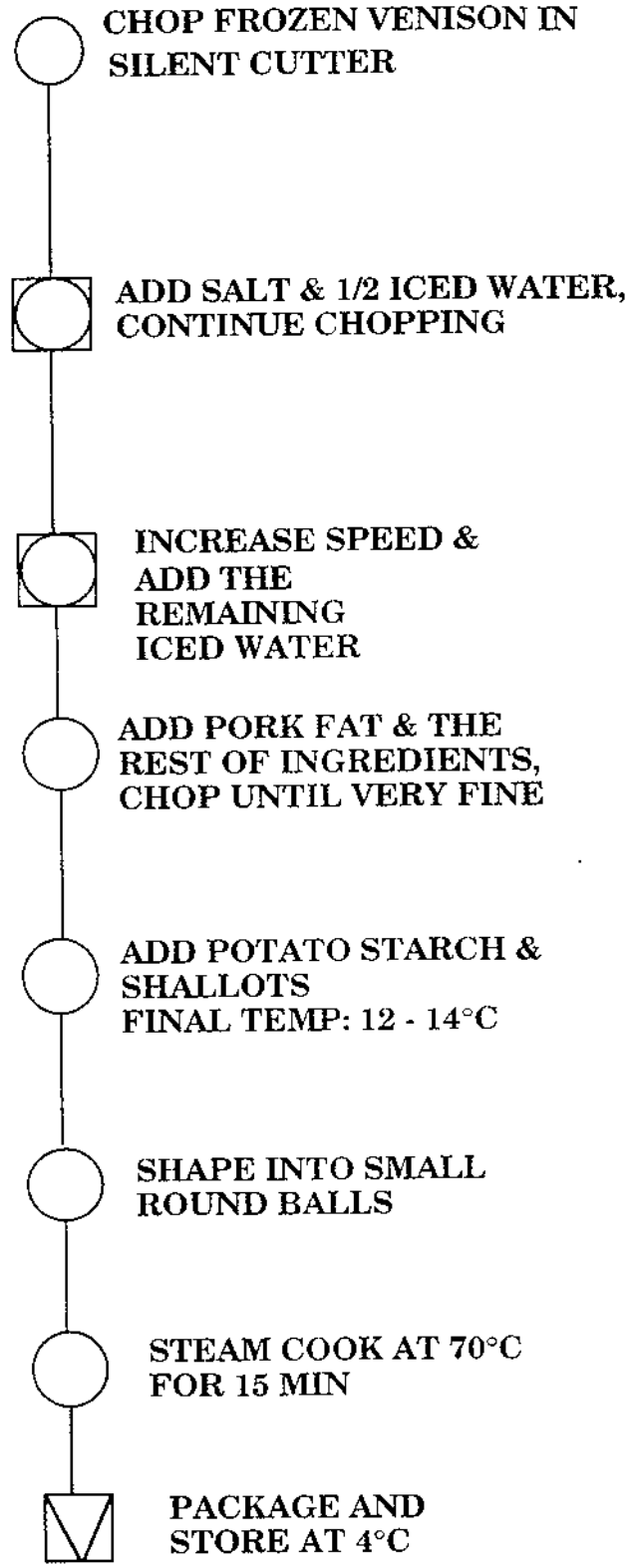
	Percentage (%)
Venison forequarter	57
Pork back fat (10 VL)	10
Salt	2.5
Potato starch	5.15
Iced water	20
Sugar	0.5
Manufacture pepper	1
- Supplied by Heimann Food Maker Pty Ltd	
MSG	0.25
Schallots	2.5
Sodium Tripolyphosphate	0.5
Garlic powder	0.5
Black pepper	0.1

Procedure

1. It is recommended to use frozen venison and chilled pork back fat.
2. Place the meat in a bowl cutter with salt and part of the iced water. Chop the meat under high speed for approximately 5 minutes.
3. During this chopping period, iced water is added gradually to keep the temperature low.
4. Pork back fat is then added together with the rest of the seasonings. It is then chopped until the mixture has a very fine texture.
5. Then add potato starch and fresh schallots. Keep the final temperature the of meat mixture between 12 - 14°C.

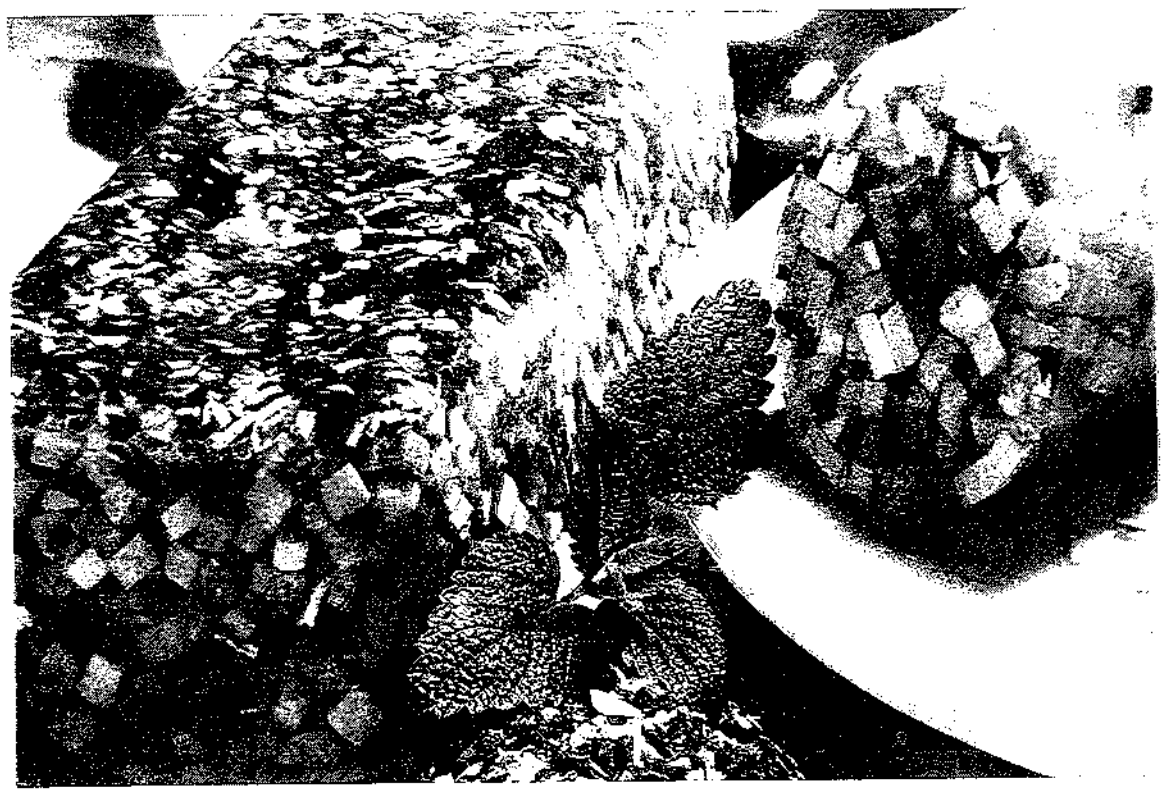
6. Form the mixture into small round balls approximately 25 - 30 g each.
7. Steam cook the meat balls at 70°C for 15 minutes.
8. Cool the product before vacuum packaging.
9. Another alternative is to flash fry the meat balls after steaming.

FLOW PROCESS CHART OF MEATBALLS



BRAWN

Cold cut in aspic is an increasingly popular item in Germany's butcheries. A low calorie count and fat ratio makes this product trendsetting. Usually only lean meat is used for this product and as a common rule, the portion of added meat must be higher than the portion of added water/gelatine. Additional decorative items, such as cucumber, sliced egg and mixed vegetables can be added to give an imaginative finishing touch.



Ingredients

	Percentage (%)
Venison forequarter	53.5
Water	35
Gelatine powder (Saw grade)	5
Supplied by Davis Gelatine Pty Ltd	
Vegetable mix Krio	5
Dry weight : 1 %.	
Upon soaking, vegetable mix will take up 4 % of water	
Supplied by H. J. Langdon & Co. Pty Ltd	
Pot herbs B.W	1.35
Supplied by H. J. Langdon & Co. Pty Ltd	
Vinegar	0.15

Procedure

1. Always use fresh meat for this type of product. Thawed meat is not suitable due to high drip loss and thus results in a lower water holding capacity.
2. The first step is to clean and trim the forequarter cuts from fatty tissue and silver skin.
3. Then dissolve the premix consisting of curing salt in the iced water.
4. Increase the surface area of the muscles by means of cutting the meat into smaller pieces of approximately 60 x 40 x 30 mm. The size of meat pieces can be varied depending on manufacturer's specification.
5. Add meat and brine into the tumbler and evacuate the air until a vacuum of approximately 90% is achieved.
6. The meat is tumbled for 10 hours or until the surface becomes sticky.

7 After tumbling, fill the muscle pieces into 85 x 750 mm fibrous casing. The recommended casing is Easy Peel fibrous casing supplied by Globus Pty Ltd.

8 The product is steam cooked to an internal temperature of 68^0C.

9 When meat is fully cooked, remove and cut in cubes of 15 x 15 mm or smaller.

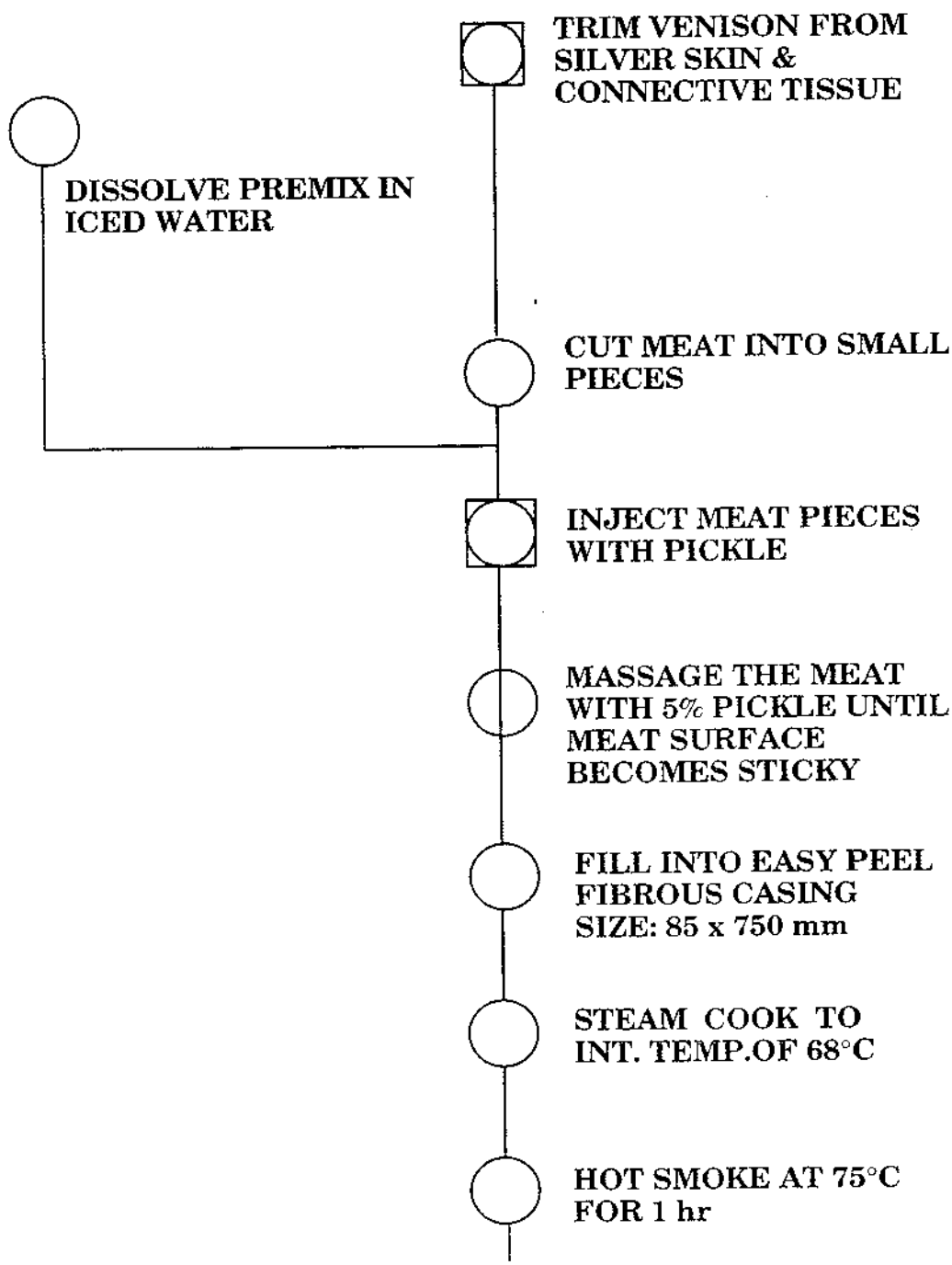
10 Meanwhile, prepare aspic solution by using cold water. Allow the gelatine to hydrate and the solution to thicken for 10 - 15 minutes without stirring. Then slowly heat the solution and stir continuously until the gelatine is fully dissolved and the solution becomes clear.

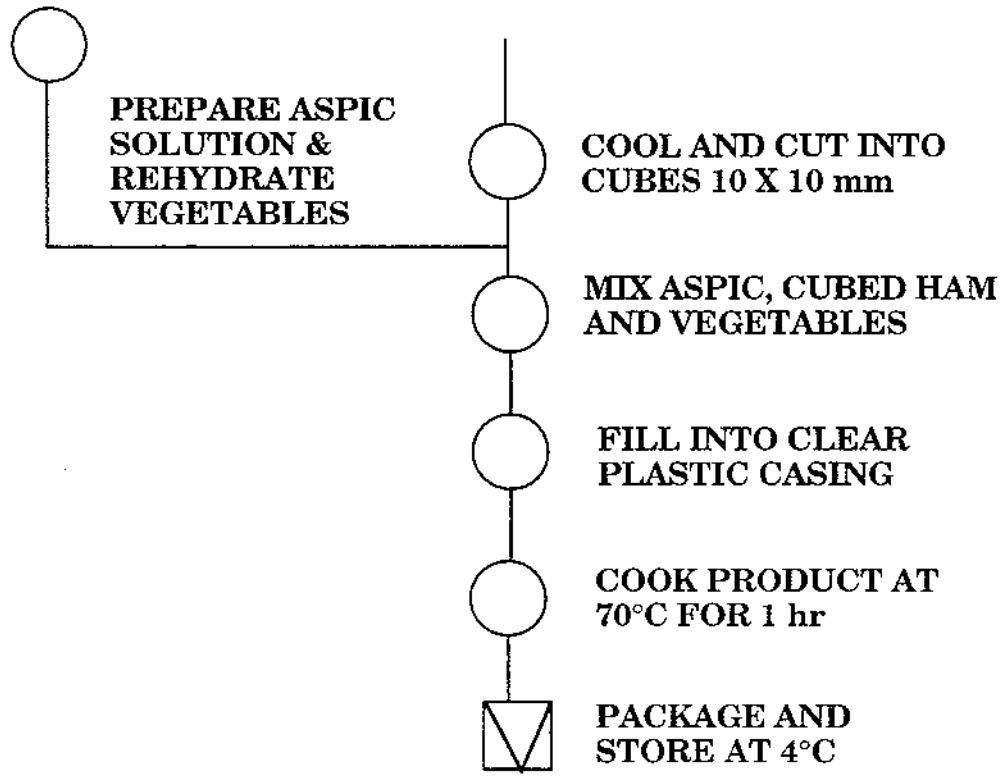
11 Add cubed meat, rehydrated vegetables and spices to aspic solution and fill into clear plastic casing while aspic is still liquid.

12 For best shelf life, cook product in a water bath for approximately 1 hour at 70 ^{0}C.

13 After cooking, let the product air dry by hanging it in the chiller at 4^0C.

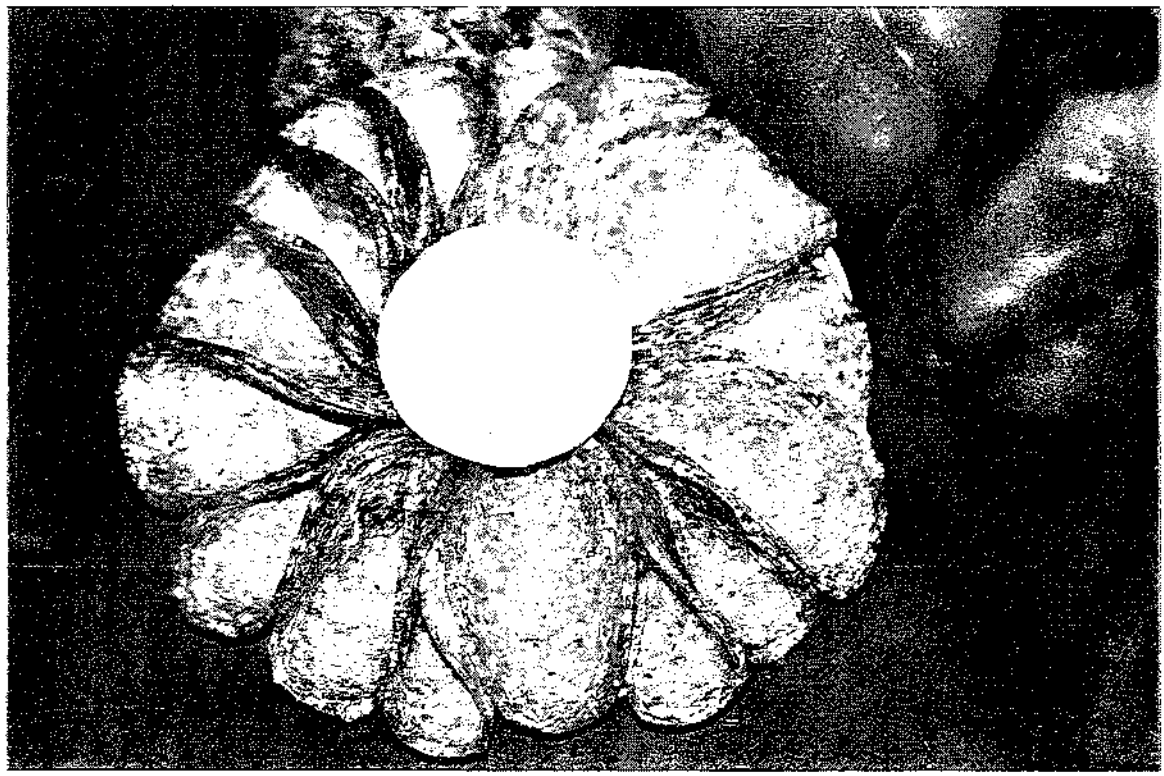
FLOW PROCESS CHART OF BRAWN




PREPARE ASPIC SOLUTION & REHYDRATE VEGETABLES
COOL AND CUT INTO CUBES 10 X 10 mm
MIX ASPIC, CUBED HAM AND VEGETABLES
FILL INTO CLEAR PLASTIC CASING
COOK PRODUCT AT 70°C FOR 1 hr
PACKAGE AND STORE AT 4°C

SALAMI

Hungarian salami has been known as a delicacy for years. The strong flavour of spices with a touch of paprika definitely will enhance the flavour and consumer preference of venison salami.



Ingredients

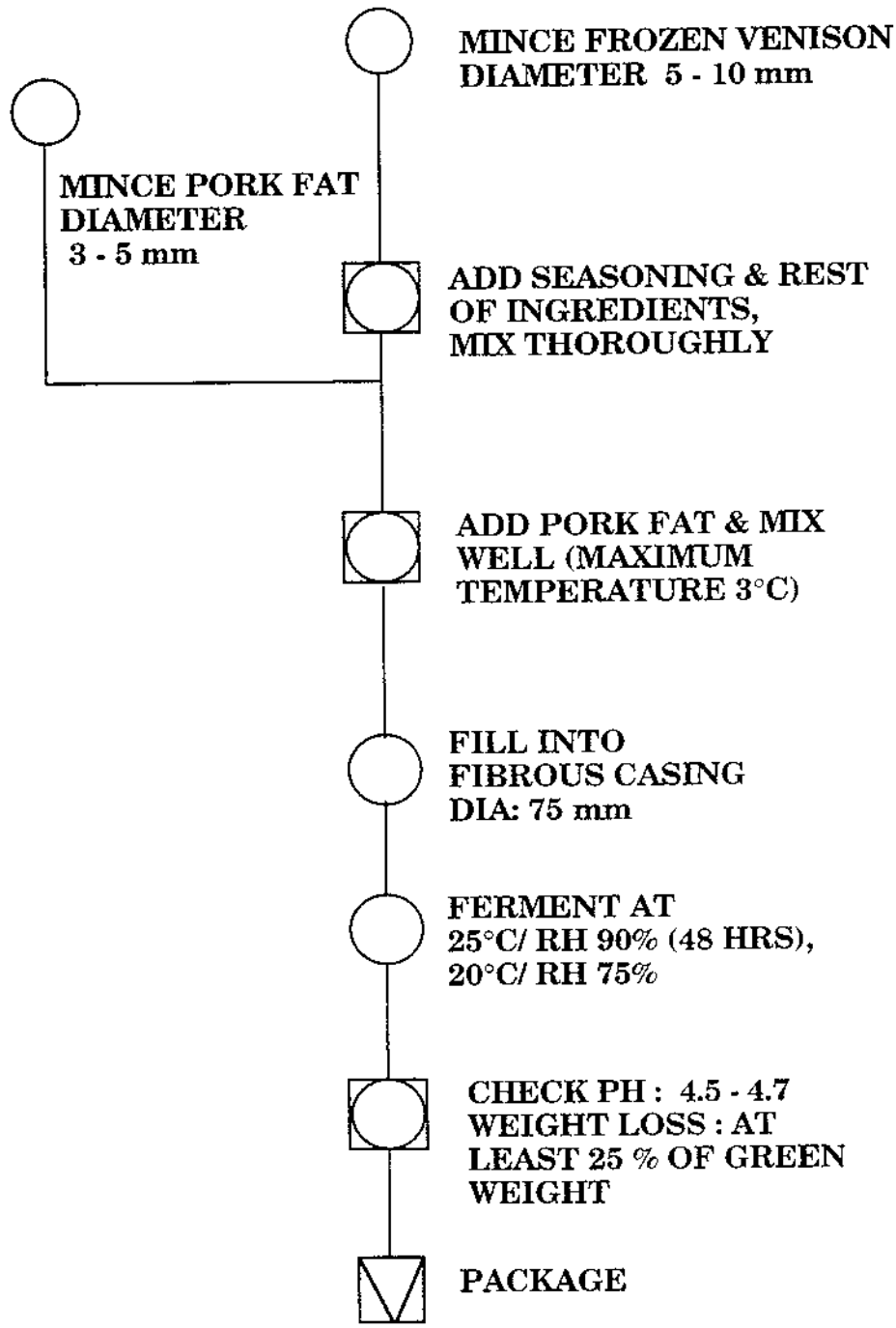
	Percentage (%)	1000 g
Venison forequarter	77.90	779.0
Pork Fat	16.00	160.0
Nitrite curing salt	3.00	30.0
Glucose	1.00	10.0
Sodium ascorbate	0.05	0.5
Starter culture	0.05	0.5
Hungarian salami seasoning	2.00	20.0

- Supplied by Globus Pty Ltd

Procedure

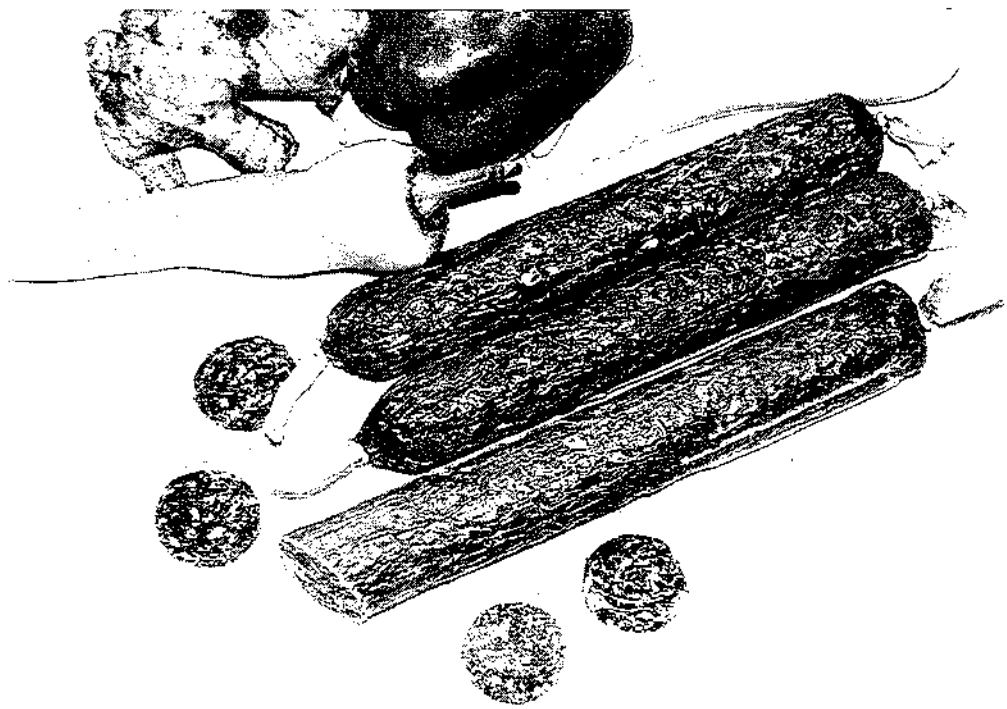
1. Mince the tempered venison forequarter through a coarse plate of 5 - 10 mm in diameter.
2. Mince the tempered fat separately through a smaller coarse plate of 3 - 5 mm in diameter.
3. Blend venison and pork fat and mix thoroughly for a few minutes. (Temperature maximum of 3^0C).
4. Fill into 75 mm fibrous casing. This type of casing is supplied by Globus Pty Ltd.
5. Fermentation was carried out at 25 ^{0}C / 90 % humidity for 48 hours, then continued at 20 ^{0}C/ 75 % humidity until the product lost 25 - 30 % of its green weight.
6. The final pH of the product should be between 4.5 - 4.8.

FLOW PROCESS CHART OF SALAMI



PEPPERONI

This small diameter fermented sausage serves as an excellent accompaniment for crackers and dips. The hot and spicy flavour blends in harmoniously with the venison to give ultimate appeal for those that " like it hot ".



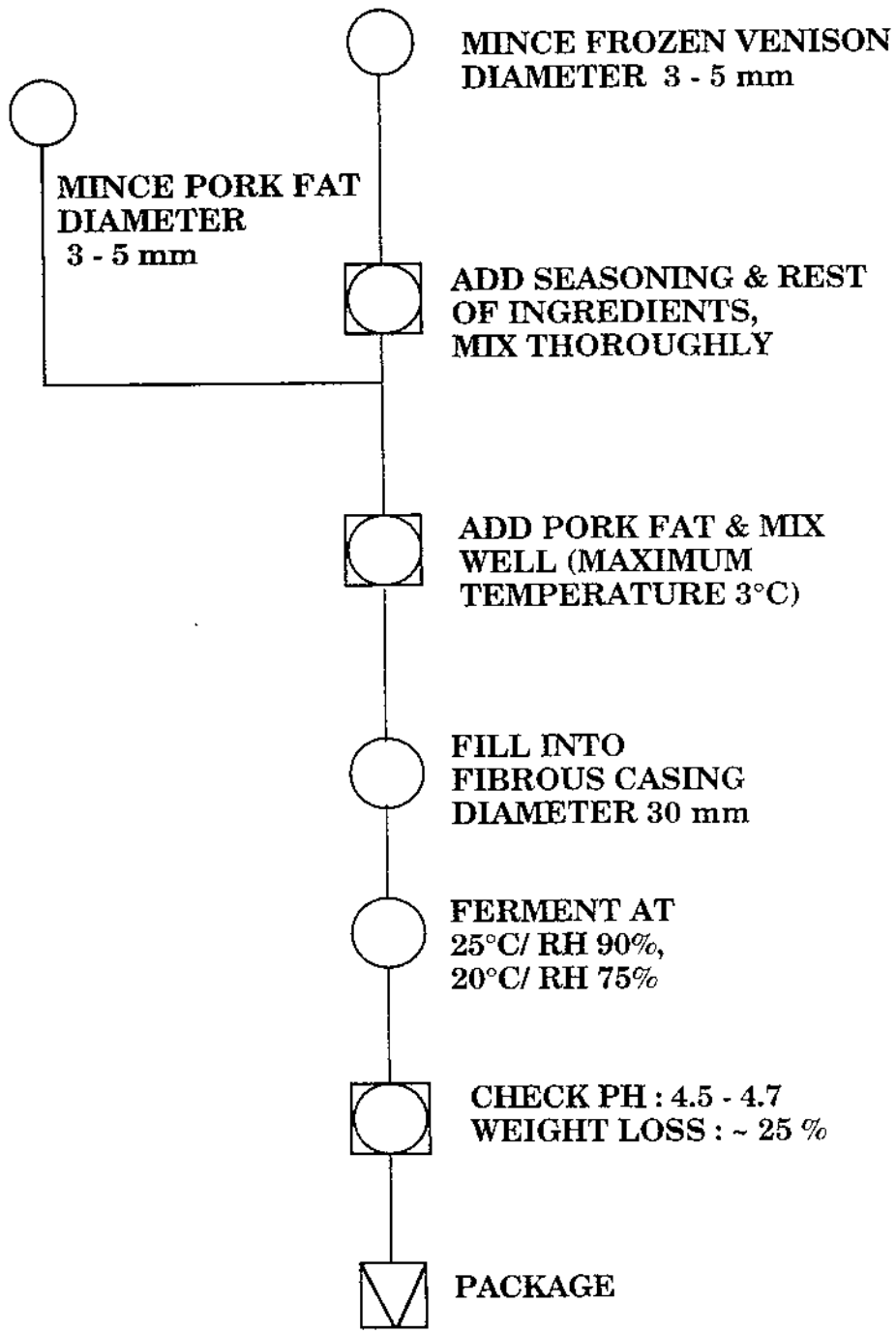
Ingredient

	Percentage (%)	1000 g
Venison forequarter	77.90	779.0
Pork fat	15.00	150.0
Cabana premix	6.50	65.0
- Supplied by Heimann Foodmaker Group		
Cayenne pepper	0.30	3.0
Ground or crushed chilli	0.25	2.5
Starter culture	0.05	0.5

Procedure

1. Mince separately the forequarter venison and pork fat through a coarse plate of 3 - 5 mm in diameter.
2 Blend the minced meat and pork fat together.
3 Add the premix, spices and starter culture to the minced mixture.
4 Mix thoroughly. (Maximum temperature of 3^0C).
5 Fill into 30 mm fibrous casing and link to desired length.
6 Fermentation was carried out at 25 ^{0}C / 90 % humidity for 48 hours, then continued at 20 ^{0}C/ 75 % humidity until the product losses 25 - 30 % of its weight.
7 The final pH of the product should be between 4.5 - 4.7.

FLOW PROCESS CHART OF PEPPERONI



FRESH CHILLED FOODS

During the last 30 years, consumer choice has been transformed by developments in the production, distribution and retailing of food, which with improvements in the design of equipment for the domestic kitchen have facilitated a major change in our life style. Perhaps the most striking development is the marketing of a wide and expanding range of chilled perishable foods. As the 1980s progressed, changes in life style resulted in smaller household units, a departure from the regular family meal time and the concept of more individuality in consumer choice for food products. Gradually, chilled foods have taken markets away from fresh and frozen foods alike. Chilled foods today occupy a very pleasant niche in the market. Convenience, single serve portions, easy preparation and the fresh and healthy image are the main attractive features.

Chilled foods are perceived by consumers as fresh and natural in character and to some extent, unprocessed or less processed compared to similar products in other technology sectors. Chilled products are considered as the nearest alternative to home made versions which could be prepared from fresh ingredients, with the associated perception of healthy eating, quality products or better quality than similar products available in other sectors.

Currently, there is a large range of red meat and poultry products available on the market. The growing demand for consumer perceived fresh prepared meals was seen as a potential market for launching venison based meals. The toughness of forequarter venison can be reduced by slicing the muscle thinly and across the grain. These ready to cook meals provide convenience

and choice for consumers to try out venison, which traditionally has had a reputation for being a "difficult to cook and serve" red meat. Fresh chilled foods can be sold over the counter or as individual packages in the supermarket.

The integrity and safety of chilled foods is multifactorial. Care is required at every stage in the food chain, from primary production of raw materials, through manufacture, distribution, retail and consumer use. Their safety and reliability have resulted from the application of scientific principles of food technology and depend on a series of safety factors in their preparation, processing, distribution and retail sale. The over-riding requirement is for the cold chain to control the temperature at every stage from the storage of raw materials to production to the moment of purchase, and the absence of abuse by the consumer. Hygienic preparation and production areas are a further essential requirement for manufacture of these products.

Plastics are the packaging materials of choice for the majority of chilled foods. Typically, the leading film consists of 15um PVDC coated PET/60um PE and the tray consists of 350 um PVC/PE. In order to extend shelf life, modified atmosphere packaging can be incorporated as well. Inert gases are the most common gases used to replace O_2. Their functions include retardation of aerobic spoilage and oxidative deterioration and as a filler gas to prevent package collapse.

Important tips for manufacturers of these styles of products -

* Temperature control and food handler hygiene are critical in assuming consumer safety with this product category.
* Labelling of these products should include-
  # recommended storage criteria
  # recommended cooling/reheat criteria
  # suggestions of accompanying dishes and foods (including recipes) to go with the particular product
  # possibly a history of where the product originated from
  # possibly a nutritional panel on the back of if it is a low energy product.

SATAY STICKS

Satay is a popular food found in South East Asia. It is an ideal and convenient serving for barbeques, parties or just simply as finger foods or snacks between meals. The combination of spices gives the meat its distinctive flavour.

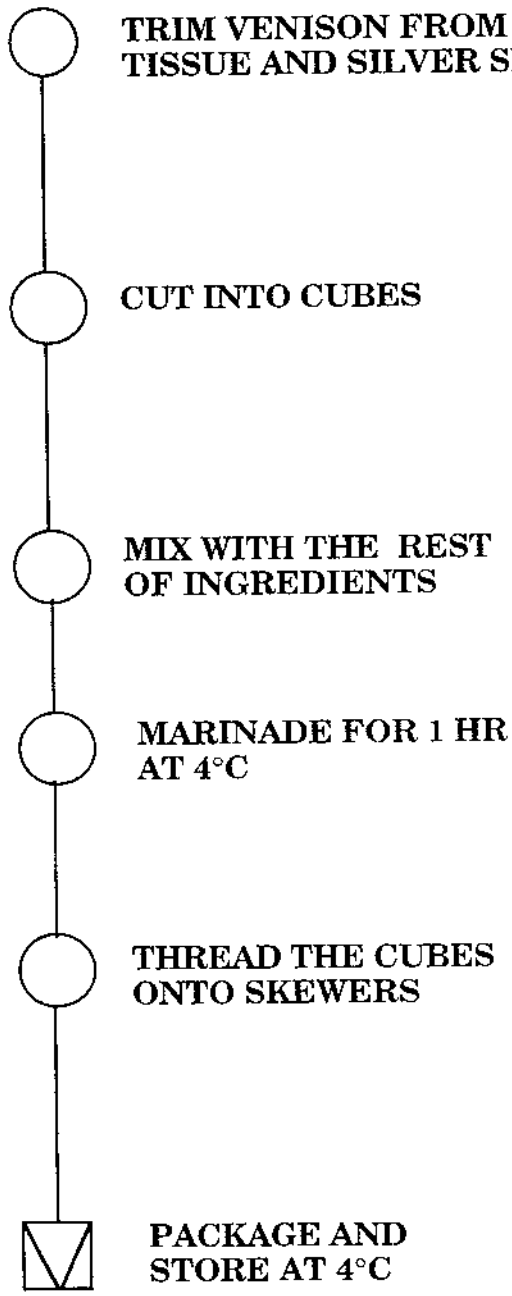
Ingredients

	Percentage (%)	1000 g
Venison forequarter	74.90	749.0
Salt	3.00	30.0
Sugar	5.00	50.0
Onion	4.00	40.0
Ginger	0.05	0.5
Garlic	1.00	10.0
Lemon juice	2.00	20.0
Coriander	5.00	50.0
Cummin	2.00	20.0
Pepper	3.00	30.0
Chilli	0.05	0.5

Procedure

1. Cut the venison forequarter into small cubes of approximately 20 x 20 x 20 mm.
2. Blend the rest of ingredients until very fine and smooth.
3. Combine the blended mixture with the meat cubes and mix thoroughly.
4. Marinate for approximately 1 hour at 4^0C.
5. Remove the meat from chiller and thread the individual cubes onto bamboo skewers.
6. Normal packaging, vacuum packaging or even modified atmosphere packaging can be used for this product type.

FLOW PROCESS CHART OF SATAY STICKS



TERIYAKI

Teriyaki has gained a growing public acceptance since its inception in Japan long ago. It has a strong flavour due to the combination of sake with soy sauce. This unique teriyaki flavour enhances the taste of venison.

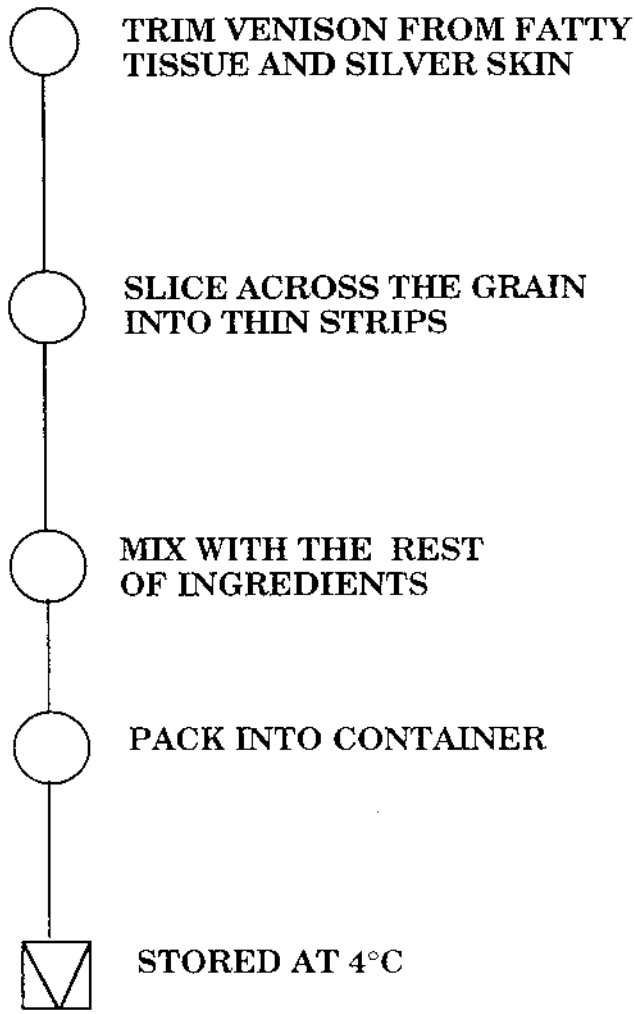
Ingredients

	Percentage (%)	1000 g
Venison forequarter	88.0	880
Japanese light soy sauce	2.0	20
Sake	5.0	50
Mirin	1.0	10
Sugar	2.5	25
Salt	1.5	15

Procedure

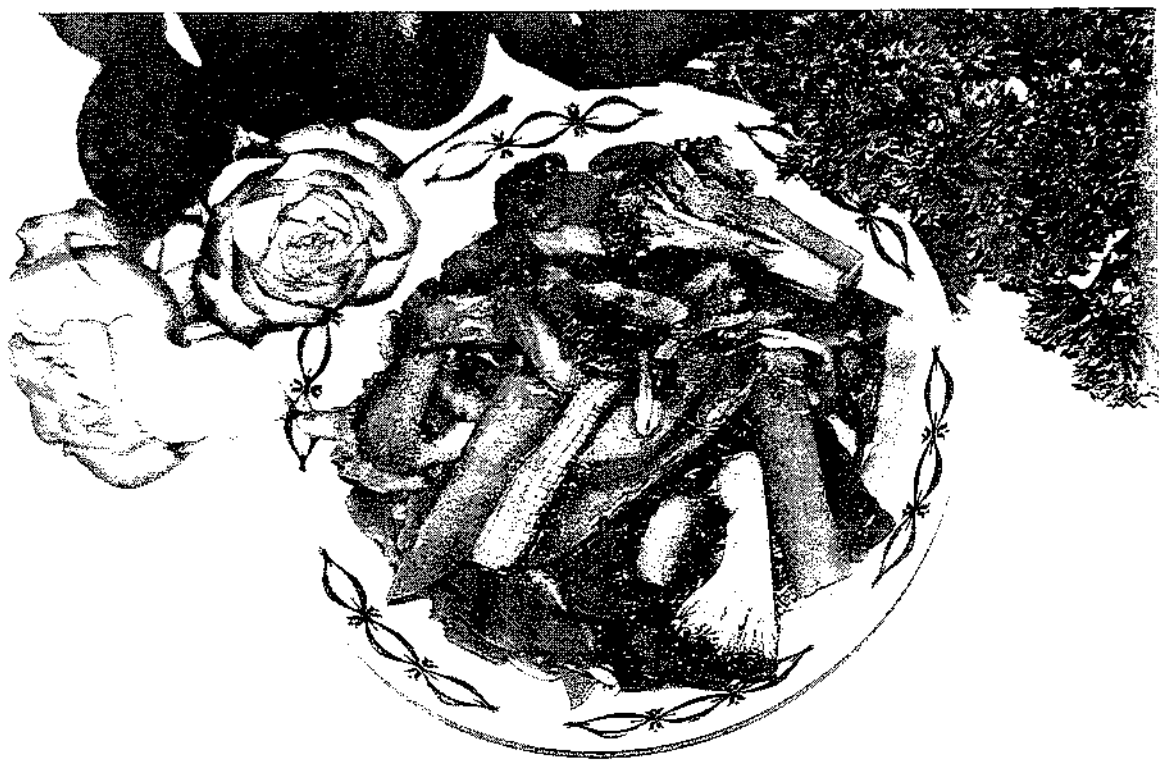
1. Slice the venison forequarter into thin strips.
2. Mix the meat with the rest of the ingredients.
3. Package to the desired weight.
4. Keep the product chilled until required.

FLOW PROCESS CHART OF TERIYAKI



SZECHUAN

This Chinese dish originated from Szechuan province and is well known for its hot and spicy flavour. A touch of chillies, sherry and sesame oil combined with the unique venison taste will certainly provide consumer appeal for this dish.



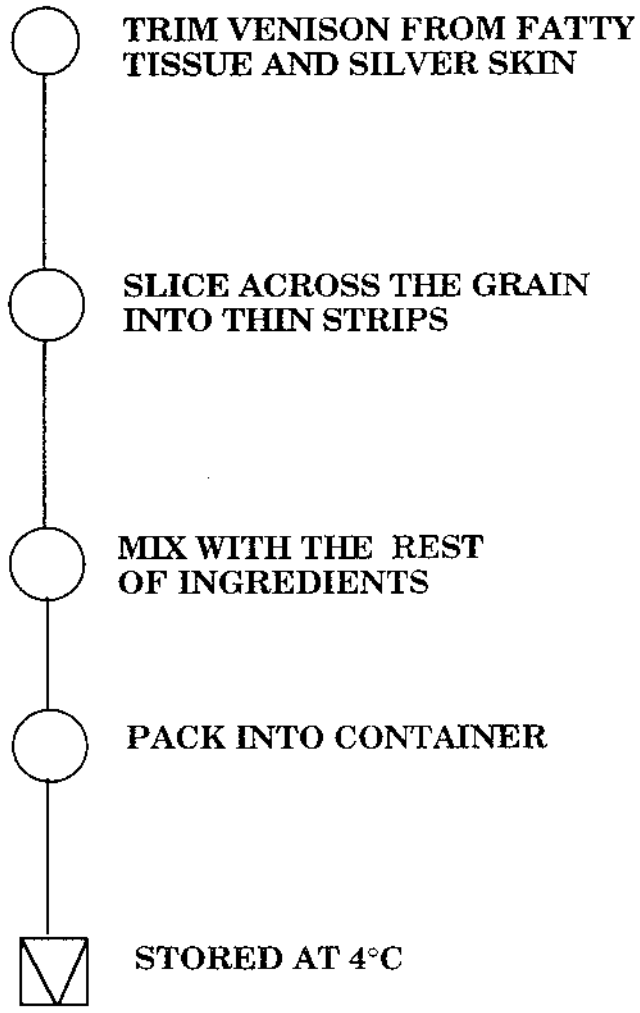
Ingredients

	Percentage (%)	1000 g
Venison forequarter	40.0	400
Salt	2.0	20
Corn starch	2.5	25
Ginger	1.0	10
Garlic	1.5	15
Spring onions	5.0	50
Vegetables	40.0	400
Rice wine	2.5	25
Soy sauce	2.5	25
Chilli sauce	1.5	15
Sesame oil	1.5	15

Procedure

1. Slice the venison forequarter into thin strips.
2. Mix the meat with the rest of the ingredients.
3. Package to the desired weight.
4. Keep the product chilled until required.

FLOW PROCESS CHART OF SZECHUAN



FINGER FOODS

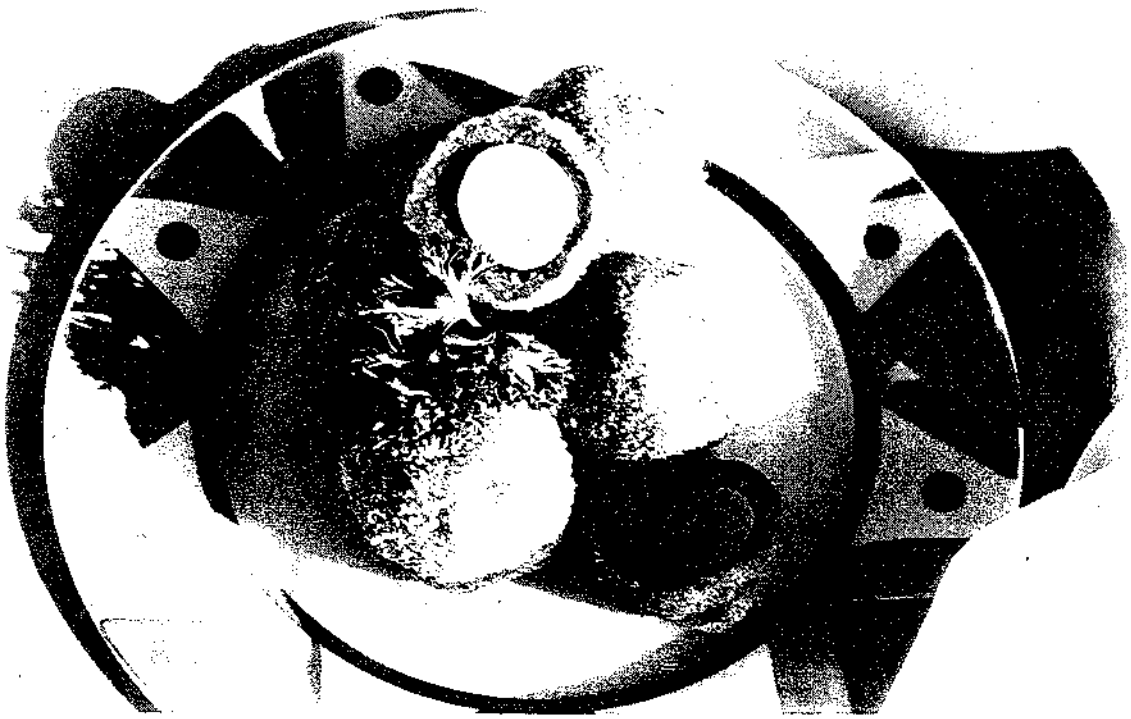
Currently, this is another emerging market that has taken a substantial share in the frozen food market segment. Although market research indicates that traditional home made finger food is still the number one preference, the new range of prepared frozen snacks are increasing in popularity. Recent surveys have shown that consumers in the mid to high income level are eager to taste and purchase finger foods made of venison.

In order to be a profitable line for the deer industry, the range of finger foods developed need to utilise as much as possible the trim and the unsaleable offcuts. The palatability of lower quality venison can be much improved if the meat is minced or comminuted. The lean meat certainly will appeal to the health conscious people. The addition of selected herbs and spices in combination with the natural mild gamey flavour of venison is definitely a delicacy.

Because finger foods are usually sold in frozen condition and reheated prior to consumption, the ingredients used or added require freeze thaw stability. A range of simple to produce finger foods are suggested in this manual. The formulations include traditional scoven eggs, a popular flaky pastry, well known croquettes and oriental meat balls.

SCOVEN EGGS

A delightful surprise will be discovered when you bite through the golden crumbed coating of a scoven egg. It encases a delicate game egg complimented by the unique flavour of venison.



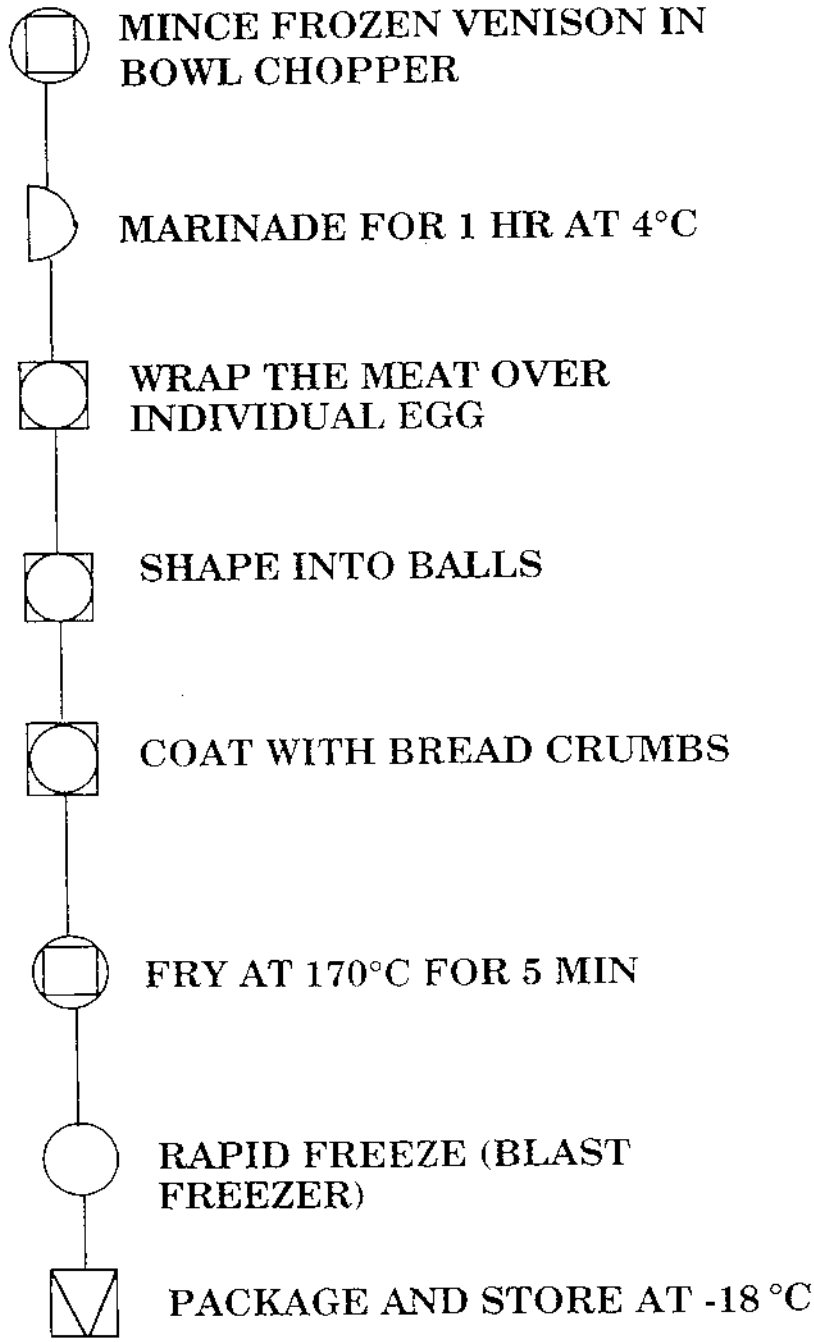
Ingredients

	Percentage (%)	Grams
Trimmed venison	39.58	1000
Water	6.93	175
Oyster sauce	4.95	125
Wheat flour	1.98	50
Corn flour	0.99	25
Soy sauce	0.99	25
Sesame oil	0.99	25
Garlic	0.40	10
Salt	0.20	5
Sugar	0.16	4
5-spice	0.06	1.5
Pepper	0.04	1.0
Quail eggs (@ 10 g)	28.43	720
Bread crumb	14.30	360

Procedure

1. Mince the frozen venison into a very fine mixture using a bowl chopper.
2. Marinate the mince for approximately 1 hour at 4^0 C.
3. Wrap the meat over the individual quail eggs.
4. Shape the marinated meat into small balls.
5. Coat the individual scoven egg with bread crumb.
6. Flash fry the scoven egg at 170^0 C for 5 min.
7. The product has to be cooled down before freezing.
8. Each frozen scoven egg is packed and stored at -18^0 C.

FLOW PROCESS CHART OF SCOVEN EGG



APRICOT PARVENS

A golden brown flaky parcel filled with an array of venison, apricots, pecans, ginger and spices. This product serves as an excellent Hors-d'oeuvre or a snack between meals. It can be served plain or with your choice of dip.

Ingredients

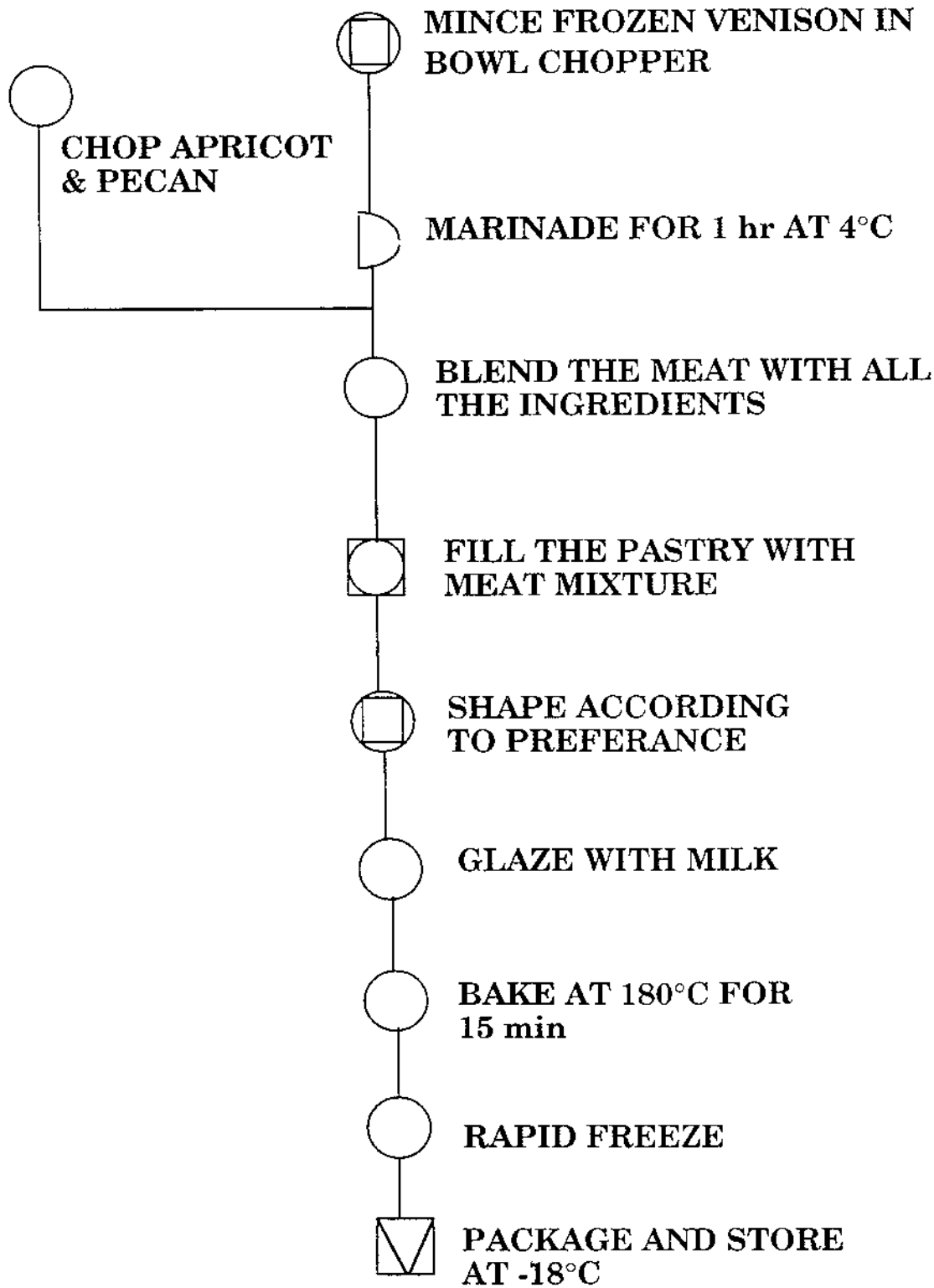
	Percentage(%)	Grams
Trimmed Venison		1000
Soy sauce	1.97	16
Ginger	0.62	5
Dried apricot	24.66	200
Pecans	24.66	200
Bread crumbs	12.33	100
Coriander	2.47	20
Apricot sauce	30.83	250
Ginger, chilli and garlic sauce	2.47	20
Butter puff pastry catering pack :	according to size	
Marinades :		
Apricot nectar	1000	79.22
Red wine vinegar	200	15.82
Soy sauce	8	0.63
Honey	56	4.43

Procedure

1. Mince the frozen venison forequarter in the bowl chopper until a fine mixture was obtained.
2. Marinate the minced venison for approximately 1 hr at 4^0C.
3. Blend and mix with chopped pecans, apricots and the remainder of ingredients.
4. Cut the butter puff pastry according to desired size.
5. Fill the minced mixture in to the pastry and wrap into individual parcels.

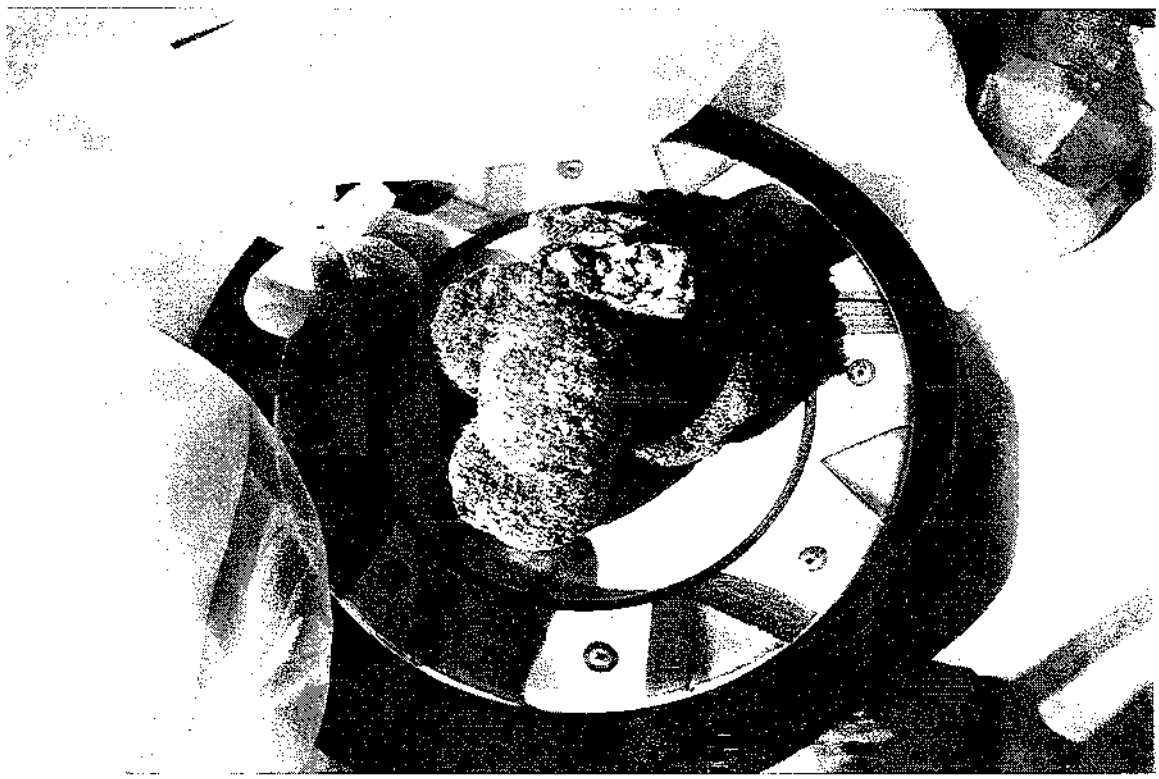
6. Glaze the surface of each pastry with milk and bake at 200 ^{0}C for 15 min.
7. Leave the pastry to cool down and then rapidly freeze the individual parcel.
8. Pack and store the product at -18 ^{0}C

FLOW PROCESS CHART OF APRICOT PARVEN



CROVENNETTES

An appetising venison croquette blended with a touch of Indian herbs and spices that will leave you wanting more! For formal occasions these can be served with a variety of sauces such as yoghurt and sour cream dip.



Ingredients

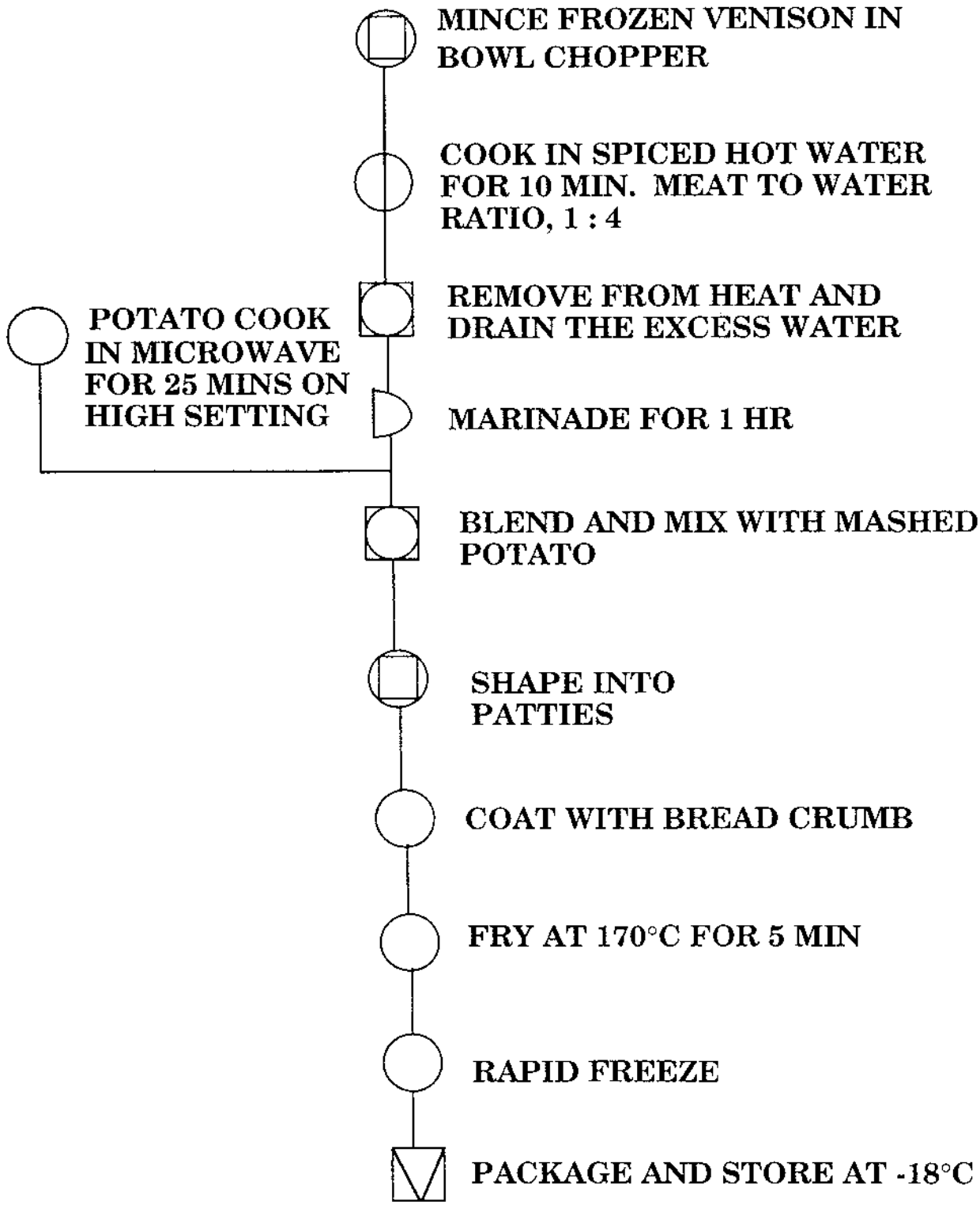
	Percentage(%)	Grams
Trimmed venison	44.74	1000
Onions	2.24	50
Ginger	0.67	15
Garlic	0.45	10
Tumeric	0.22	5
Chilli	0.45	10
Coriander	1.34	30
Potato	32.22	720
Salt	0.45	10
Pepper	0.45	10
Bread crumb	16.78	375

Procedure

1. Mince the frozen venison coarsely in a bowl chopper.
2. Cook the minced meat in spiced hot water for 10 min. The ratio of meat to water is 1 : 4.
3. Remove the cooked mixture from heat and drain away the excess water.
4. Marinate the meat for approximately 1 hour at 4 ^{0}C.
5. Meanwhile, cook the potato in a microwave on high setting or in boiling water for 25 min.
6. After the potato is thoroughly cooked, remove from heat and the skin is peeled off.
7. Mash cooled potato into a very fine paste.
8. Blend and mix the meat with mashed potato.

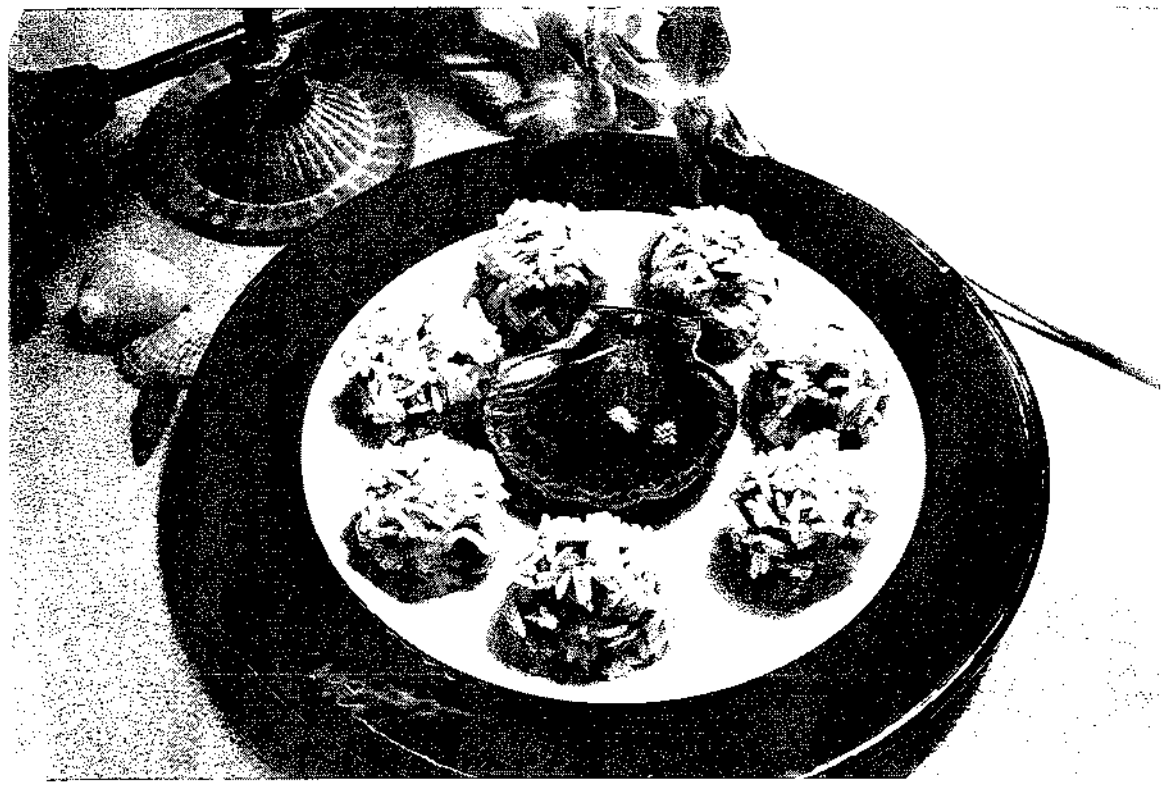
9. Shape the mixture into small patties either manually or using a pattie forming machine.
10. Coat the individual patties with bread crumbs and flash fry at 170 ^{0}C for 5 min.
11. Let the product cool before rapid freezing.
12. Pack and store at - 18 ^{0}C.

FLOW PROCESS CHART OF CROVENETTES



ORIENTAL PEARLS

A harmonious blend of oriental spices and venison encased in Arborio rice and steamed in the traditional Chinese manner.



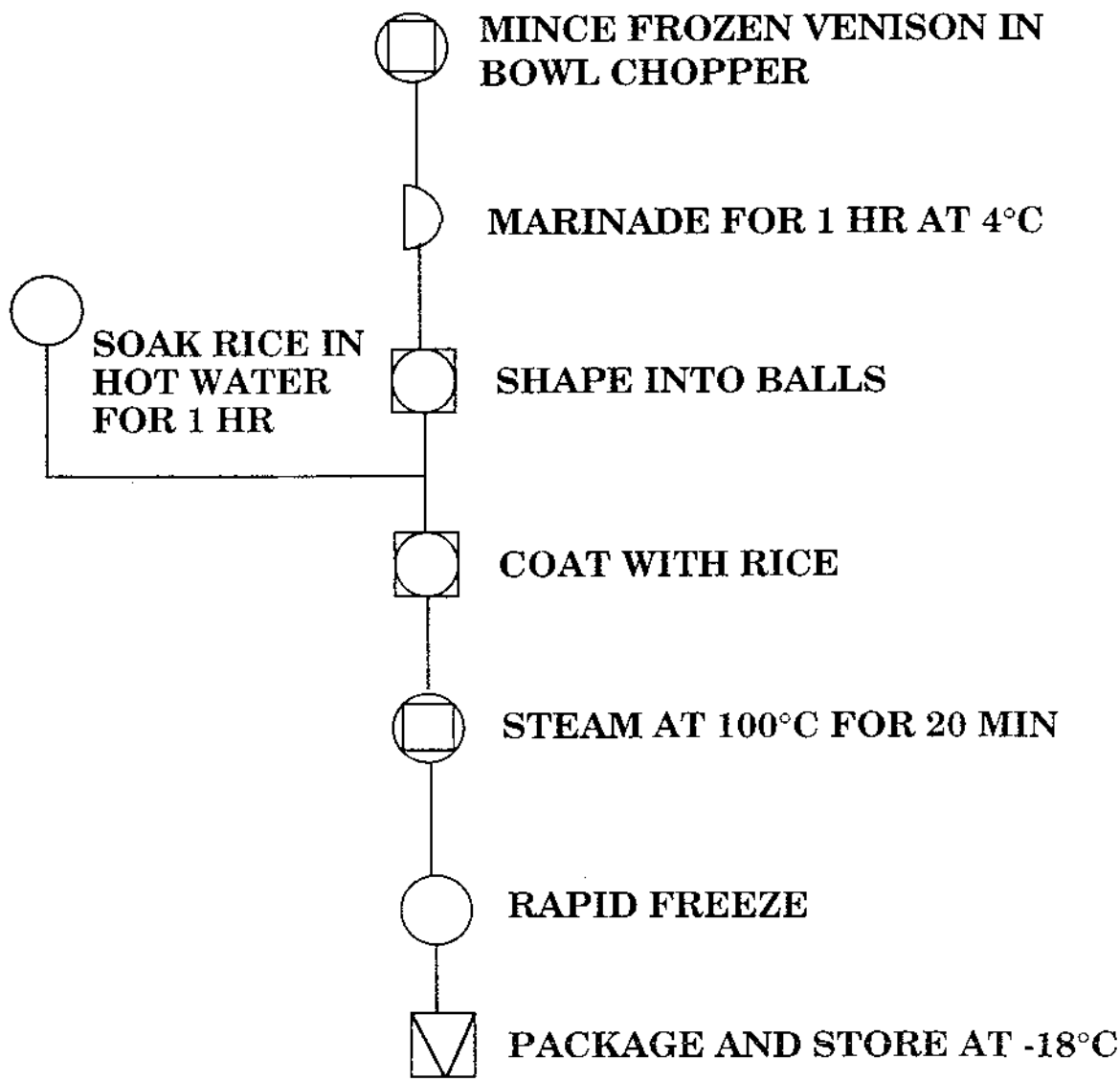
Ingredient

	Percentage (%)	Grams
Trimmed venison	46.52	1000
Water	8.14	175
Oyster sauce	5.82	125
Wheat flour	2.33	50
Corn flour	1.16	25
Soy sauce	1.16	25
Sesame oil	1.16	25
Garlic	0.10	0.46
Salt	0.05	0.23
Sugar	0.04	0.19
5-spice	0.015	0.07
Pepper	0.01	0.05
Arborio rice	33.49	720

Procedure

1. Mince the frozen venison in a bowl chopper to a fine mixture.
2. Marinate the mince meat for 1 hour at 4^0 C.
3. Meanwhile soak the Arborio rice in hot water for approximately 1 hour.
4. Shape the mixture into small meat balls.
5. Coat the meat balls with pre-soaked Arborio rice.
6. Steam the meat balls for approximately 20 min or until the rice is cooked.
7. Let the oriental pearls cool before freezing.
8. Pack and store the product at -18 ^{0}C.

FLOW PROCESS CHART OF ORIENTAL PEARL



MICROWAVEABLE FOODS

Market research has shown that the majority of employed young people have limited time available for meal preparation. Working long hours also results in lack of interest and creativity for food preparation. Furthermore, people with sufficient income will find it more rewarding to eat out or have their meal prepared. The idea of preparing meals from scratch has been viewed as wasteful of time, food and energy.

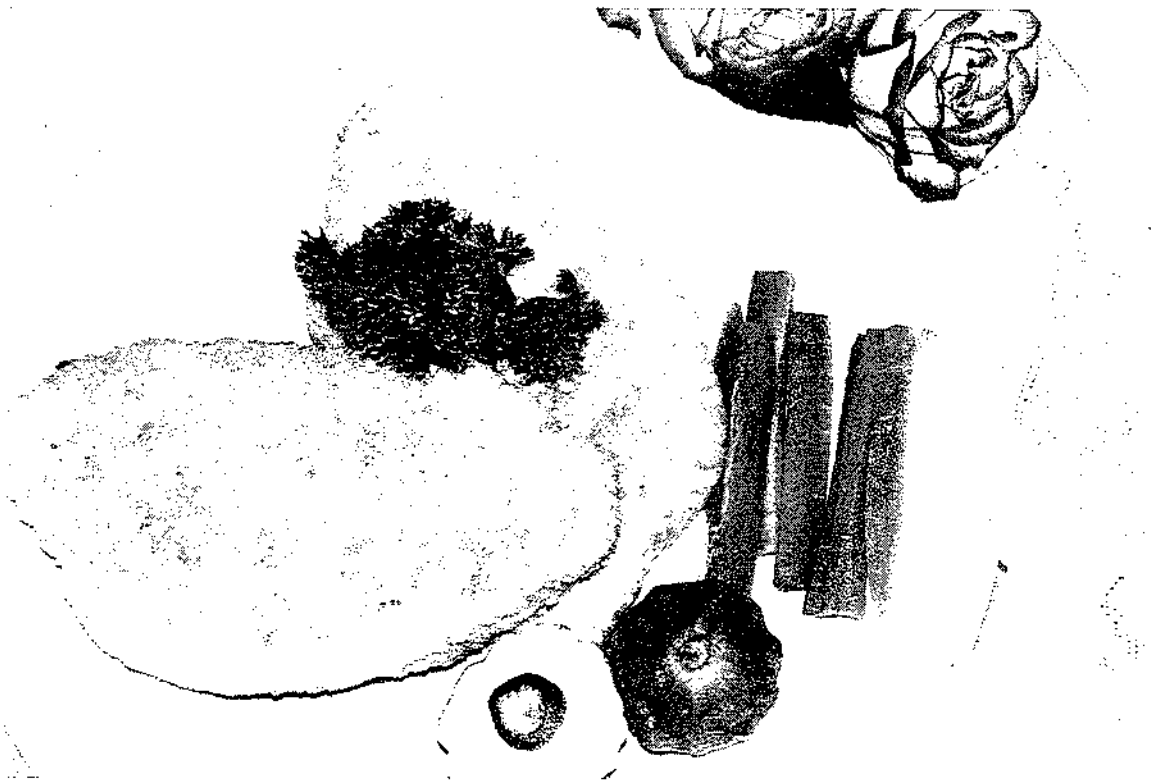
Over the years the marketing of portion controlled - heat and eat meals was made possible through the development of the microwave oven. In 1991, it was found that 43% of Australian households were using microwave ovens. The percentage of microwave oven sales has continued to increase rapidly ever since. This is the main driving force behind the sudden increase in convenience meals on the supermarket shelves. Microwaveable food can be sold in either a shelf stable or frozen state. The food is normally pre-cooked and ready within seconds after heating. Frozen food however, will take a slightly longer heating time as it needs to pass through a thawing period prior to cooking.

Because venison is not a commonly eaten red meat in many parts of the world, consumers find it difficult to prepare and serve as a meal. With the advancement of microwave technology, prepared meals using venison as the main ingredient will certainly provide more opportunity for consumers to taste different types of venison meals. A range of prepared meals will give consumers the impression that venison is no different to other red meats, apart from being more healthy due to the leanness of the major raw material.

Two types of microwaveable food currently exist in the market and these are shelf stable and deep frozen. Shelf stable food is usually packed in a sterile plastic container that can be heated immediately. Deep frozen food have utilised a variety of packaging styles, ranging from plastic pouches, plastic containers, cardboard and aluminium foil. The formulation of microwaveable food should not be complicated, as long as freeze thaw stability can be ensured in the case of frozen food products. Packaging is another area of importance. For total convenience and less wastage, the meal should be packed on trays or in containers that can be deep frozen and are also capable of withstanding temperatures of up to 200 ^{o}C, in which case the frozen meal can be directly served on the same tray. An example of this type of tray is the CPET range, which is available from ACI plastic packaging.

VENISON KIEV

Venison Kiev consists of a tender fillet of venison filled with a touch of tasty and juicy garlic butter. The kiev is fried until golden brown with the special coating of light, delicate and crisp Japanese crumbs which the whole family will enjoy to eat.



Ingredients

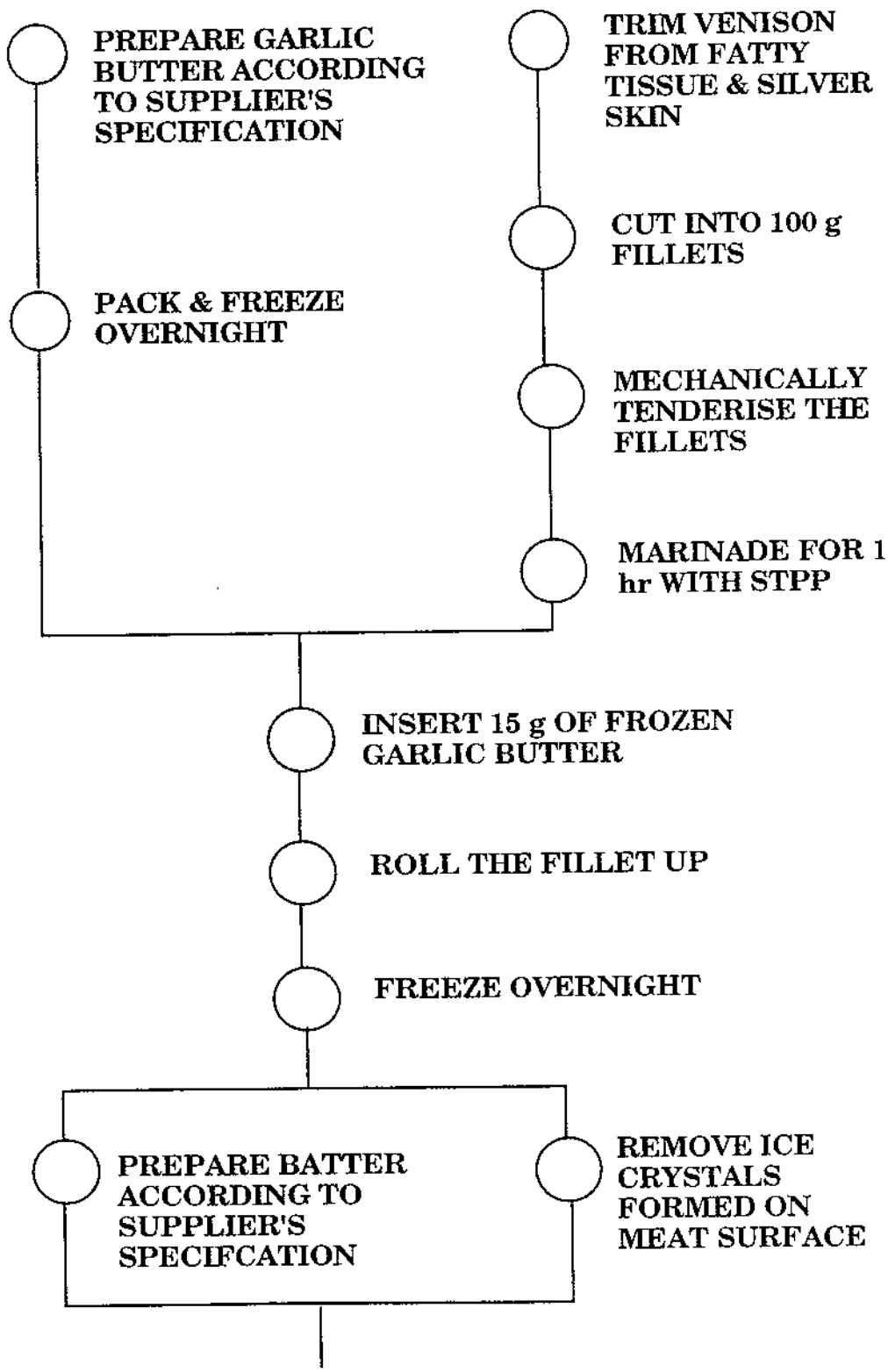
	%
* Venison forequarter	95.0
Sodium Tripolyphosphate (STTP)	5.0
* Garlic butter sauce:	%
1. Aqueous phase	
Garlic Oleoresin	2.50
- Supplied by National Starch & Chemical Pty Ltd	
Colflo 67 starch	3.00
- Supplied by National Starch & Chemical Pty Ltd	
Keltrol xanthan gum	0.10
- Supplied by Kelco International	
Sugar	1.10
Parsley	0.20
Water	93.1
2. Oil phase	%
Butter	99.7
DG-037A Emulsifier	0.30
- Supplied by Davis-Germantown	
* Coating :	%
Crisp film	5
- Supplied by National Starch & Chemical Pty Ltd	
20054 Adhesion batter mix	95
- Supplied by New Foods Coating	
Water	
Ratio water to battermix : 2 : 1	
13507 Predust	
- Supplied by New Foods Coating	

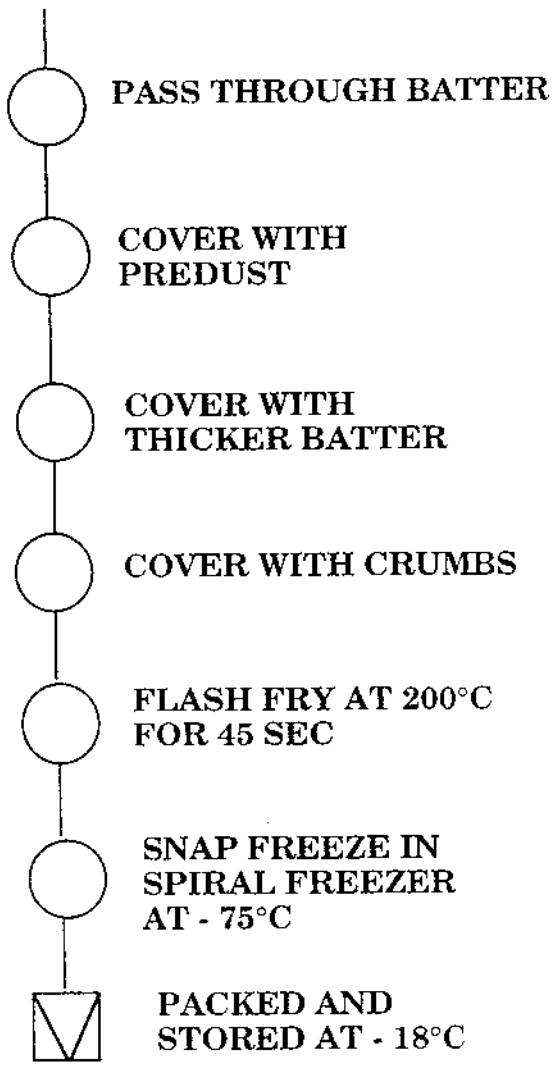
	%
6014 Toasted Japanese style breadcrumbs - Supplied by New Foods Coating	70
Tip Top breadcrumbs - Supplied by New Foods Coating	30

Procedure

1. Prepare the meat pieces by trimming off the connective tissue and fat.
2. Cut the meat to desired size and weigh the individual pieces to approximately 100 g.
3. Marinate the meat pieces in a solution of sodium tripolyphosphate for 1 hour at 4 ^{0}C.
4. Meanwhile prepare the garlic butter according to the suppliers' specification.
5. Next step is to insert a 15 g piece of garlic butter into the venison fillet.
6. Roll the fillet up and freeze overnight.
7. The next processing day, prepare the battermix according to the suppliers' specification.
8. Remove the ice crystals formed on the surface of the meat pieces either by a quick spray or dipped into water.
9. Pass the fillet through the batter.
10. Lightly cover with pre-dust.
11. Dip the fillets into a thicker batter.
12. Completely cover the venison fillet with breadcrumbs.
13. Air spray to remove excess crumbs.
14. Flash fry the product at 200 ^{0}C for 45 sec.
15. Snap freeze in spiral freezer at -75 ^{0}C for 15 minutes.
16. Package and store in freezer at -18 ^{0}C.

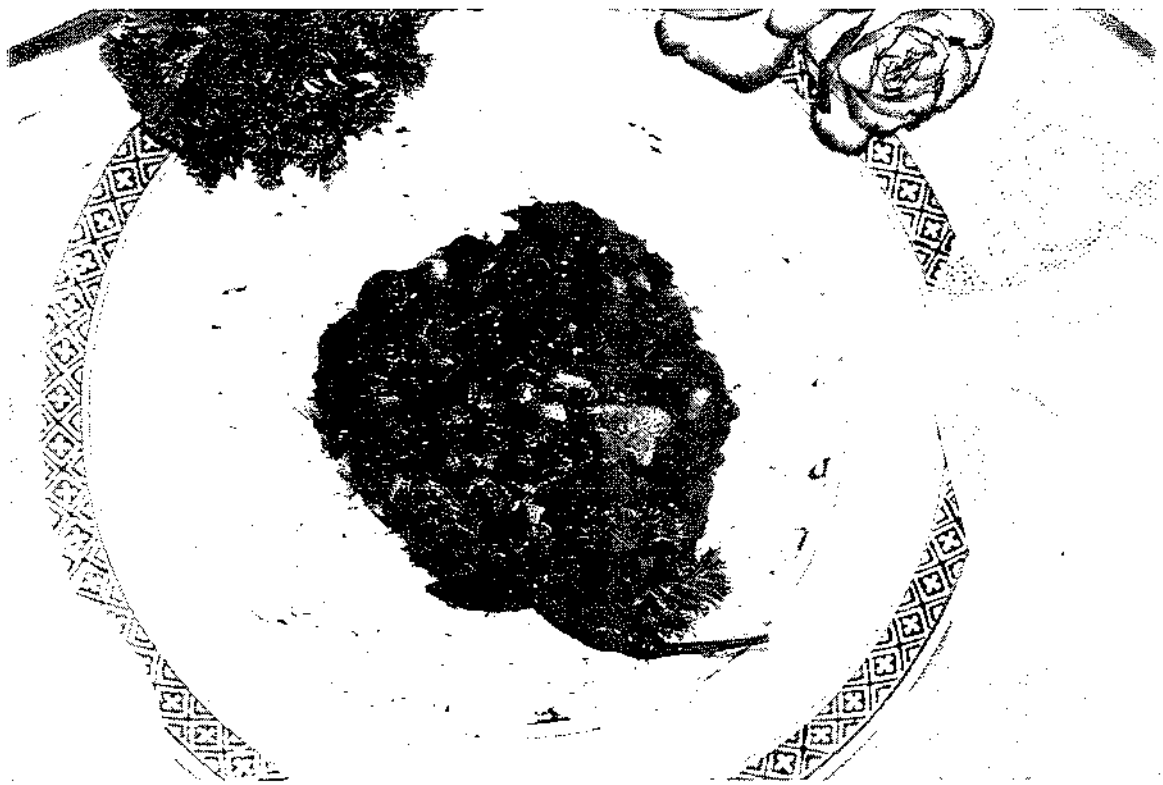
FLOW PROCESS CHART OF VENISON KIEV




PASS THROUGH BATTER
COVER WITH PREDUST
COVER WITH THICKER BATTER
COVER WITH CRUMBS
FLASH FRY AT 200°C FOR 45 SEC
SNAP FREEZE IN SPIRAL FREEZER AT - 75°C
PACKED AND STORED AT - 18°C

GOULASH

Goulash is a very well known dish throughout the world which originated in Hungary. There are many variations but ultimately it has a distinctive paprika flavour. Combination of venison with selected herbs and spices produces an extremely tasty venison Goulash.



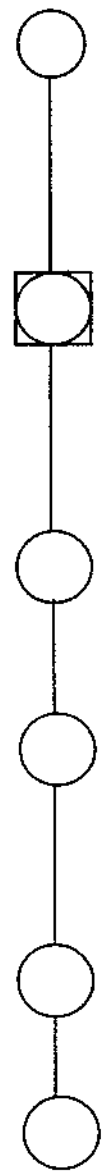
Ingredients

	Percentage (%)	1000 g
Venison forequarter	30.0	300
Salt	4.5	45
Pepper	1.5	15
Paprika	1.5	15
Caraway seeds	1.0	10
Parsley	1.0	10
Onions	5.0	50
Potato	15.0	150
Vegetable oil	5.0	50
Water	27.5	275
Hydrolysed Vegetable Protein	2.5	25
Thickener (1422)	3.5	35
Vegetable gum (415)	2.0	20

Procedure

1. Slice the venison forequarter into cubes of approximately 20 x 20 x 20mm.
2. Cut the potato into large chunks.
3. Chop the onion coarsely.
4. Brown the onion with vegetable oil.
5. Mix potato and the meat pieces together with the remainder of the ingredients.
6. Simmer the mixture for approximately 30 minutes.
7. Fill the hot mixture into sterile containers.
8. Seal the container under aseptic conditions.

FLOW PROCESS CHART OF GOULASH



TRIM VENISON FROM FATTY TISSUE AND SILVER SKIN

CUT MEAT INTO CUBE, CHOP ONION & CUT POTATO

MIX WITH THE REST OF INGREDIENTS

COOK THE MEAT FOR 30 MINUTES

FILLED AND SEALED INTO CONTAINER

STERILISE OR PASTURISE THE PRODUCT ACCORDING TO TYPE OF PACKAGING AND TEMPERATURE OF STORAGE

RENDANG CURRY

Curries are a popular component of South East Asian cuisine. They are heavily spiced and characterised with a thick coconut gravy. The combination of herbs and spices together with the large quantity of coconut milk produces a tasty dish.

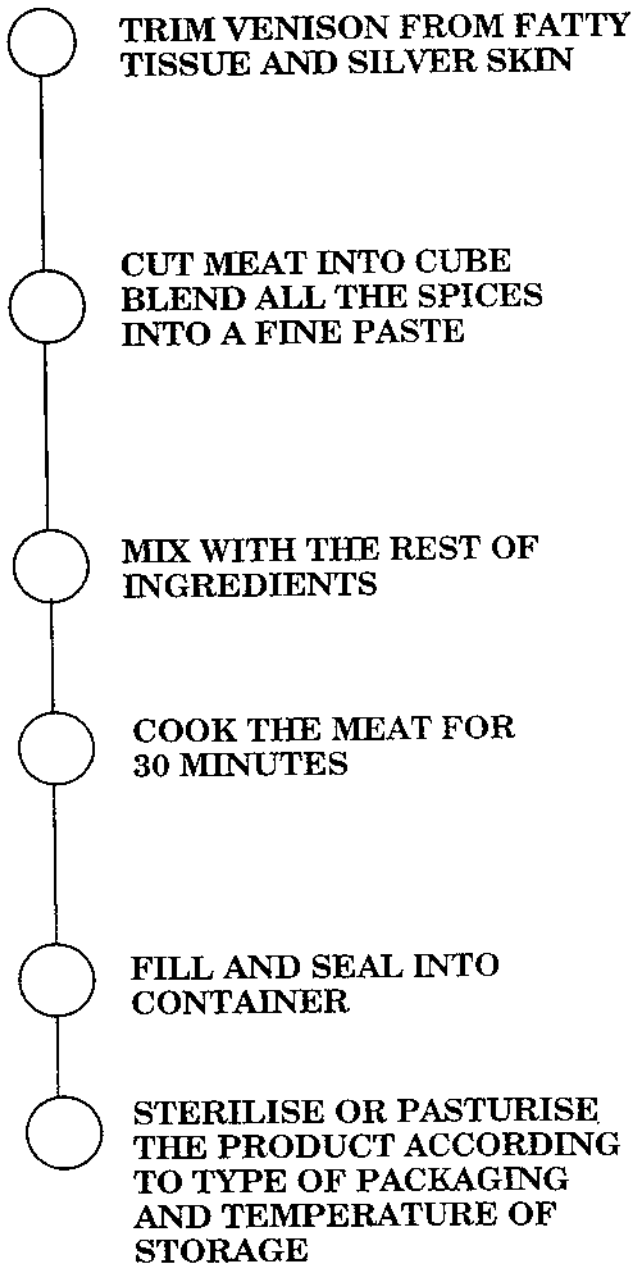
Ingredients

	Percentage (%)	1000 g
Venison forequarter	27.5	275
Coconut powder	10.0	100
Water	25.0	250
Sugar	5.0	50
Salt	2.5	25
Onion	5.0	50
Garlic	0.5	5
Chillies	1.0	10
Turmeric	0.5	5
Coriander	5.0	50
Cummin	2.5	25
Candle nut	1.0	10
Bay leaves	0.5	5
Lemon grass	5.0	50
Galanga	1.0	10
Thickener (1422)	3.5	35
Emulsifier (322)	2.5	25
Vegetable gum (415)	1.5	15

Procedure

1. Cut the venison forequarter into cubes of approximately 20 x 20 x 20mm.
2. Blend the ingredients into a very fine paste.
3. Mix the meat cubes into the spices.
4. Simmer the meat and spices for approximately 30 minutes.
5. Fill the hot mixture into sterile containers.
6. Seal the container under aseptic conditions.

FLOW PROCESS CHART OF RENDANG CURRY



STROGANOFF

Stroganoff is a traditional English dish. It has been widely accepted and popular amongst consumers. Beef is the most commonly used red meat, but venison stroganoff has a delicately distinguished flavour of its own.

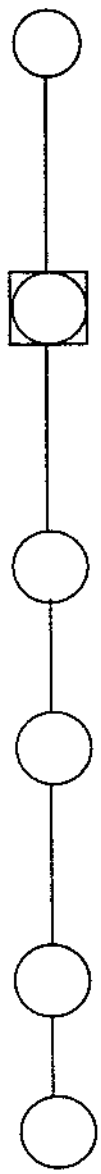
Ingredients

	Percentage (%)	1000 g
Venison forequarter	30.0	300
Sugar	2.5	25
Salt	4.5	45
Pepper	1.5	15
Onions	7.5	75
Mushrooms	10.0	100
Tomato paste	5.0	50
Vegetable oil	4.5	45
Water	26.5	265
Hydrolysed Vegetable Protein	2.5	25
Thickener (1422)	3.5	35
Vegetable gum (415)	2.0	20

Procedure

1. Slice the venison forequarter into cubes of approximately 20 x 20 x 20mm.
2. Slice the mushroom into thin strips.
3. Cut the onions into large chunks.
4. Brown the vegetables with the oil.
5. Mix vegetables and meat pieces together with the rest of ingredients.
6. Simmer the mixture for approximately 30 minutes.
7. Fill the hot mixture into sterile containers.
8. Seal the container under aseptic conditions.

FLOW PROCESS CHART OF STROGANOFF



TRIM VENISON FROM FATTY TISSUE AND SILVER SKIN

CUT MEAT INTO CUBE, SLICE ONION & MUSHROOM

MIX WITH THE REST OF INGREDIENTS

COOK THE MEAT FOR 1/2 HR

FILL AND SEAL INTO CONTAINER

STERILISE OR PASTURISE THE PRODUCT ACCORDING TO TYPE OF PACKAGING

EQUIPMENT

The major item's of equipment used for smallgoods production are listed as follows:

Vacuum Massager

The massaging equipment can be cylindrical or tank shaped in which air can be evacuated to give a vacuum environment. When rotating and containing meat and brine, the brine is incorporated into the meat and at the same time the soft soluble protein is extracted. Vacuum is used to prevent foaming of the brine during tumbling. The massager is used primarily to tenderise the meat and increase binding capacity. Commonly used for cured products and re-formed products.

Filler/Extruder

Filler is used for filling/extruding the meat (whole pieces, matrix, etc) into casings. The products can be adjusted with respect to firmness, weight, length, etc. Filling can be carried out manually or automatically. The best filling is done under vacuum to prevent entrapped air bubbles inside the product. Sausage fillers commonly are used in conjunction with linkers and clippers.

Bowl Chopper

The cutting action is based on vertically rotating knives in a horizontally turning bowl. It is used for cutting and mixing ingredients for emulsified products.

Vacuum Cutter with Steam Jacketed Bowl

It has a horizontal cutting action which allows manual stirring during processing. Air can be evacuated to prevent trapped air pockets in the product. It is primarily used for emulsions and finely minced emulsified products. These cutters often have steam jacketed bowls for heating and/or cooling products and also live steam injection facilities.

Injector

The main function of the injector is to incorporate brine into whole meat pieces. Injection shortens massaging time and ensures homogenous distribution of brine in the meat through a large number of needles. It also serves as a tenderiser through the perforating action of the needles. The equipment has a pressure and speed controller. By manipulating these parameters, the yield of the product can be varied accordingly. Primarily used for cured products, such as hams, chicken rolls, etc.

Mincer

Equipment used for mincing meat and fat to a specific particle size. The fineness can be varied according to the need and purpose of the final product.

Smoke house

Are used for dry and steam heat treatments, smoking and (cooling) of meat products. Generally are computerised so that the required condition can be controlled exactly. Many smokehouses can control the relative humidity of the air in the house, allowing for drying and fermentation functions.

Tenderiser

A group of needles or knives perforating the meat by cutting the meat tissue. This is to tenderise the meat, but also to shorten massaging time when brine is to be incorporated. Primarily used for cured products, such as hams.

Casing clipper

Tightens the casings after filling, to achieve improved firmness and consistency. After the tightening the casings are closed with a clip.

Vacuum sealer

The vacuum sealers starts by forming a bag, the product is then filled into the bag. Air is evacuated and the bag is sealed. The air can be replaced with other gases if required. This technique is commonly known as Modified Atmosphere Packaging.

TECHNICAL TERMS

Brine

Usually an aqueous solution of salt, phosphate and dextrose intended for incorporation into meat, poultry or fish. Curing salts are also incorporated for cured meat products.

Connective tissue

Tissue which surrounds muscle fibres and bundles and connects the muscles with the bones. Consists mainly of collagen and elastin.

Cured meat

Meat which has been treated with a brine or dry mixture containing salt and nitrite/nitrate.

Emulsifier

An emulsifier is a surface active agent which reduces the interfacial tension so that extremely fine droplets of the emulsified liquid can be formed.

Injection

Incorporation of brine into the product. Industrially this is done by a multi-needle injector.

Massaging

Mechanical treatment of meat and brine in order to incorporate brine and/or extract proteins.

Nitrite salt

Sodium chloride containing nitrite usually sodium nitrite.

Osmosis

Diffusion of ions/molecules across a semi-permeable membrane/wall due to differences in concentrations on each side of the membrane.

Oxidation

Chemical reaction of ingredients with oxygen which decreases shelf life (oxidation of fat results in rancidity).

pH

The negative logarithm of the hydrogen concentration which is a measurement of a solution's acidity. Low pH (less than 7) - acidic. High pH (higher than 7) - alkaline. pH 7 is neutral and corresponds to pure water.

Shelf life

The durability of a product, the time a product will keep before undergoing deterioration.

Water activity

The ratio between the actual water vapour pressure and the water vapour pressure of the pure water at a defined temperature.

FLOW PROCESS CHART SYMBOLS

Flow Process Chart (FPC) is a graphical way to describe the manufacturing process. By using standardised formats for FPC, it is possible :

1. To highlight process bottlenecks (ie: long delays between operations).
2. To identify stages where quality is not controlled or assured.
3. To control costs.
4. To optimise the use of factory floor space and available equipment.

Symbol used in Flow Process Charts

OPERATION. An operation occurs when a material is intentionally changed in any of its characteristics; or is arranged for another operation, transportation, inspection or storage. An operation also occurs when information is given or received or when planning or calculating takes place.

TRANSPORTATION. A transportation occurs when a material is moved from one place to another, except when such movements are a part of the operation or are caused by the operator at the work station during an operation or an inspection.

INSPECTION. An inspection occurs when a material is examined for identification or is verified for quality or quantity in any of its characteristics. It provides control of the process, but does not take the material any nearer to its completion.

DELAY. A delay occurs to a material when conditions, except those which intentionally change the physical or chemical characteristics of the object, do not permit immediate performance of the next planned action.

STORAGE. A storage occurs when a material is kept and protected against unauthorised removal.

COMBINED ACTIVITY. When it is desired to show activities performed either concurrently or by the same operator at the same work station, the symbols for those activities are combined, as shown by the circle placed within the square to represent a combined operation and inspection.

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