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## Chapter 19

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# Organic Processing of Meat and Meat Products in India

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## 1. INTRODUCTION

Food and Agricultural Organization (FAO)/World Health Organization (WHO) Codex Alimentarius Commission defines organic farming as “a unique production system which promotes and enhances agro-ecosystem health, including biodiversity, socio-economic biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs”. Organic system of production aims to promote sustainable production system which is environmental friendly and assures highest standards of welfare to animals. Demand for organic products is steadily increasing across the world due to increasing health consciousness among consumers. Scientific studies have also shown that organic meat has very low total lipid content and possess poly unsaturated fatty acid/saturated fatty acid and n-6/n-3 indices within the recommended values for the human diet. Keeping in mind the low input practices followed by Indian farmers especially in rural and tribal areas it is assumed that India holds tremendous potential in organic food production. This has created a business opportunity for producers too.

A lot of confusion exists among consumers as to what “organic” means. Marketers have extracted almost every word that connotes organic – *natural, naturally raised, free range, hormone-free* and *additive-free* – each means far from being “certified

organic". Organic meat comes from an animal that has not been fed anything grown with toxic or synthetic fertilizers, pesticides, herbicides, fungicides or fumigants; has not been given any kind of growth hormone, antibiotic or genetically engineered product; has been conceived by organically raised animals; and has been butchered and processed following organic regulations.

In India, organic production practices are guided by National Program for Organic Production (NPOP) guidelines of Agricultural and processed Food Products Export Development Authority (APEDA). Production of organic meat and meat products is challenging as it involves compliance to organic standards at every step starting from production of organic feed, rearing of meat animals, slaughter, value addition, packaging and labeling. Often each of these steps is undertaken by different sets of people at different locations. Hence, organic meat production requires brining about a complete change in the production and processing patterns of meat and meat products. So far production of organic meat and meat products is very limited in India. This chapter provides brief information about different aspects of organic meat processing including method of production and marketing opportunities.

## **2. Organic Meat Production in India**

There is no inherent nutritional advantage in the organic foods over non-organics, but it is a type of production system which makes organic food "healthier" than non-organics. Western countries have more stringent laws for use of pesticides as compared to conventional farming in India. India is one of the largest users of pesticide in Asia and also one of the largest manufacturers. So, organic food/meat production has a very special importance in India.

Organic cultivation is particularly suitable for a country like India with a huge population of small farmers who still use traditional methods of farming with few agricultural inputs. It is estimated that 65 per cent of the country's cropped area is organic by default, as the small farmers have no choice but to farm without chemical fertilizers and pesticides as they cannot afford. This default status coupled with India's inherent advantages, such as, its varied agro-climatic regions, local self-sustaining agri-systems, sizeable number of progressive farmers and ready availability of inexpensive manpower translate into the potential to cultivate a vast basket of products organically. Similarly, animal husbandry practices followed in tribal and rural areas are near organic as they do not involve much of chemical and synthetic feed additives.

Currently organic meat marketing is limited to supermarkets catering to niche consumer segments in different metro cities. In general, Indian meat industry is an unorganized sector. Although there are few ultra-modern export units they do not have control over production practices of farmers. On the other hand, farmers do not find it worth to follow organic animal rearing as there is no organized setup for its collection and processing. Entrepreneurs interested in organic production are also often deterred by prevalence of diseases and extreme weather conditions. In addition, lack of availability of medications alternative to traditional allopathic drugs is an impediment in growth of organic meat animal production. Extensive

research and production of medications acceptable in organic animal husbandry like Ayurvedic, Homeopathic, *etc.* are crucial for development of the sector in India.

### **3. Regulations for Organic Meat and Meat Products in India**

Organic animal husbandry in India is guided by NPOP published by APEDA in 2001. There are several certifying agencies, which provide certification based on the NPOP guidelines. It is necessary to involve certifying agencies from the initial stage of establishment of organic production units to ensure that all necessary guidelines are followed and documented suitably. Only those farms, which have been certified, can put the label of 'organic'.

NPOP provides a complete protocol to be followed for rearing of meat animals. General principle for organic animal husbandry should be governed by the physiological and ethological needs of the farm animals in question. This requires animals to be allowed to conduct their basic behavioural needs and that all management techniques should be concerned for the good health and welfare of the animals. Animals must be provided space for free movement and access to sufficient fresh air and natural daylight. Ample access to fresh water and feed must be provided according to the needs of the animals. No compounds used for construction materials or production equipment shall be used which might detrimentally affect human or animal health. All animals shall have access to open air and/or grazing appropriate to the type of animal and season taking into account their age and condition.

#### **3.1 Conversion Period**

The establishment of organic animal husbandry requires an interim period, the conversion period. The whole farm, including livestock, should be converted according to the prescribed periods. Conversion may be accomplished over a period of time. Replacement animal should be brought onto the holding at the start of the production cycle. Animal products may be sold as "product of organic agriculture" only after the farm or relevant part of it has been under conversion for at least twelve months and provided the organic animal production standards have been met for the appropriate time. The certification programme shall specify the length of time by which the animal production standards shall be met. With regard to dairy and egg production, this period shall not be less than 30 days. Animals present on the farm at the time of conversion may be sold for organic meat if the organic standards have been followed for 12 months. All organic animals should be born and raised in the organic holding. When organic livestock is not available, the certification programme will allow brought-in conventional animals according to the following age limits: 2 day old chickens for meat production, 18 week old hens for egg production, 2 week old for any other poultry, piglets up to six weeks and after weaning and calves up to 4 weeks old which have received colostrum and are fed a diet consisting mainly of full milk.

#### **3.2 Breeds and Breeding**

Breeds should be chosen which are adapted to local conditions. Breeding goals should not be at variance with the animal's natural behaviour and should be

directed towards good health. Breeding shall not include methods which make the farming system dependent on high technological and capital intensive methods. Artificial insemination is allowed. Embryo transfer techniques are not allowed in organic agriculture.

### **3.3 Mutilations**

Mutilations are not allowed but shall allow the following exceptions: castrations, tail docking of lambs, dehorning, ringing and mulesing (the process of removing folds of skin from the tail area of a sheep, intended to reduce fly strike). Suffering shall be minimized and anaesthetics used where ever appropriate.

### **3.4 Animal Nutrition**

The livestock should be fed 100 per cent organically grown feed of good quality. All feed shall come from the farm itself or be produced within the region. The diet should be balanced according to the nutritional needs of the animals. Products from the organic feed processing industry shall be used. The certification programme shall draw up standards for feed and feed ingredients. The prevailing part (at least more than 50 per cent) of the feed shall come from the farm unit itself or shall be produced in co-operation with other organic farms in the region. The certification programme shall allow exceptions with regard to local conditions under a set of time limit for implementation. For the calculation purpose only, feed produced on the farm unit during the first year of organic management, may be classed as organic. This refers only to feed for animals which are themselves being reared within the farm unit and such feed may not be sold or otherwise marketed as organic.

### **3.5 Products not Allowed in Farming**

Synthetic growth promoters or stimulants, synthetic appetizers, preservatives, except when used as a processing aid *etc.* vitamins, trace elements and supplements can be used from natural origin when available in appropriate quantity and quality. The certification programme shall define conditions for use of vitamins and minerals from synthesized or unnatural sources. All ruminants shall have daily access to organically grown roughages.

### **3.6 Veterinary Medicine**

Management practices should be directed to the wellbeing of animals, achieving maximum resistance against disease and preventing infections. Sick and injured animals shall be given prompt and adequate treatment. Natural medicines and methods, including homeopathy, ayurvedic, unani medicine and acupuncture, shall be emphasized. When illness does occur, the aim should be to find the cause and prevent future outbreaks by changing management practices. Vaccinations shall be used only when diseases are known or expected to be a problem in the region of the farm and where these diseases cannot be controlled by other management techniques.

## **4. International Standards for Organic Meat Processing**

Legislated standards are established at the national level, and vary from country

to country. In recent years, many countries have legislated organic production, including the European Union (EU) nations (1990s), Japan (2001), and the US (2002). Non-governmental national and international associations also have their own production standards. In countries where production is regulated, these agencies must be accredited by the government. Since 1993 when EU Council Regulation 2092/91 became effective, organic food production has been strictly regulated in the UK. In India, standards for organic agriculture were announced in May 2001, and the NPOP is administered under the Ministry of Commerce. (<http://www.apeda.com/organic/quality.html>).

Every country has its own guidelines for production of organic food production. In 2002, the United States Department of Agriculture (USDA) established production standards, under the National Organic Program (NOP), which regulate the commercial use of the term organic, whereas Australia has National Standard for Organic and Bio-dynamic products. With the aim to harmonize organic standards across the world, Food and Agricultural Organization (FAO) has published a set of standards titled 'Guidelines for the production, processing, labelling and marketing of organically produced foods' (GL 32 – 1999, Rev. 1 – 2001). Codex Alimentarius Commission (CAC) has 'Guidelines for the production, processing, labelling and marketing of organically produced foods' (GL 32 – 1999) for guiding organic food production. In India, organic meat production is guided by NPOP guidelines of APEDA which has been recognized by European Commission and Switzerland as equivalent to their country standards. Similarly, USDA has recognized NPOP conformity assessment procedures of accreditation as equivalent to that of US. With these recognitions, Indian organic products duly certified by the accredited Certification Bodies of India are accepted by the importing countries. However, producer aiming to export organic products must essentially know the organic standards of importing countries and follow it accordingly to increase the acceptability of the products.

## **5. Transport and Slaughter of Livestock for Organic Meat Processing**

As per NPOP guidelines, transport and slaughter should minimize stress to the animal. Transport distance and frequency should be minimized. The transport medium should be appropriate for each animal. Animals should be inspected regularly, watered and fed during transport depending on weather conditions and duration of the transport. Stress to the animal shall be minimized, especially taking into consideration: contact (by eye, ear or smell) of each animal with dead animals or animals in the killing process, resting time to release stress and each animal shall be stunned before being bled to death. The equipment used for stunning should be in good working order. Exceptions regarding stunning can be made according to cultural practices. Where animals are bled without prior stunning, this should take place in a calm environment. Throughout the different steps of the process, there shall be a person responsible for the well-being of the animal. Handling during transport and slaughter shall be calm and gentle. The use of electric sticks and such instruments are prohibited. Slaughter and transportation standards that will take

into consideration: stress caused to the animal and person in-charge, fitness of the animal, loading and unloading, mixing different groups of animals or animals of different sex, quality and suitability of mode of transport and handling equipment, temperatures and relative humidity, hunger and thirst and specific needs of each animal. No chemical synthesized tranquilizers or stimulants shall be given prior to or during transport. Each animal or group of animals shall be identifiable during all steps. Where the transport is by axle, the journey time to the slaughter house shall not exceed eight hours. In general, animals slaughtered must be certified organic and record trail should be maintained till its marketing to ensure quality.

## **6. Organic Sanitizing and Disinfecting Agents for Meat Processing Plants and Handlers**

Sanitizers and disinfectants are extremely essential for maintaining food safety standards in meat processing plant. In India, no specific list of organic sanitizers is approved under NPOP. Hot water under pressure will considerably help in maintaining hygiene standards. Any compounds which do not adversely affect the quality of meat can be used. In United States, chlorine is allowed as fungicide, disinfectant and sanitizer for organic production. Ozone is also approved and is having comparable disinfecting power as that of chlorine, but it is more costly as it is a highly unstable compound. Apart from the above, Peroxy-acetic acid (PAA) is also allowed in organic production.

List of products authorized for cleaning and disinfection of buildings and installations include potassium and sodium soap, water and steam, milk of lime, lime, quicklime, sodium hypochlorite (e.g. as liquid bleach), caustic potash, hydrogen peroxide, natural essences of plants, citric, peracetic acid, formic, lactic, oxalic and acetic acid, alcohol, nitric acid (dairy equipment), phosphoric acid (dairy equipment), formaldehyde and sodium carbonate.

## **7. Ingredients, Additives and Processing Aids for Organic Meat Products**

Production and marketing of organically processed value added meat products provides logical completion to effort put for maintaining organic standards in the farm, transportation and slaughter of animals. Major ingredients used for production of value added meat products are meat, fillers, condiments, spices, oil, nitrite, phosphate, salt and water. To get the organic certification, all the ingredients used for production processed meat products must be certified organic. With the growth of organic agriculture across India, availability of organic ingredients of plant origins is rapidly increasing. Consequently, organic flours, spice mix, oil, vegetables, etc. are easily available in super markets especially in major cities. Nitrate/nitrite and phosphates are the commonly used chemicals in the production of value added meat products. But for producing organic processed products, these chemicals should not be used. But nitrite is an important component which gives cured color and flavor and inhibits *Clostridium botulinum*. Several vegetable ingredients contain high content of nitrate which needs to be converted to active form nitrite to make it functional in meat system. Addition of lactic acid starter culture can convert nitrate

to active form nitrite (Agricultural Utilization Research Institute, <http://www.auri.org>). During production of organic processed meat products, care should be taken not to allow food to come in contact with chemicals contraindicated under organic system. 100 per cent of the ingredients of agriculture origin shall be certified organic. For the production of enzymes and other micro-biological products the medium shall be composed of organic ingredients. In cases where an ingredient of organic agriculture origin is not available in sufficient quality or quantity, the certification programme may authorize use of non-organic raw materials subject to periodic re-evaluation. Such non-organic raw material shall not be genetically engineered. The same ingredient within one product shall not be derived both from an organic and non-organic origin. Water and salt may be used in organic products. Minerals (including trace elements), vitamins and similar isolated ingredients shall not be used. The certification programme may, grant exceptions where use is legally required or where severe dietary, or nutritional deficiency can be demonstrated.

Preparations of micro-organisms and enzymes commonly used in food processing may be used, with the exception of genetically engineered micro-organisms and their products. The use of additives and processing aids shall be restricted. In cases where an ingredient of organic origin is unavailable in sufficient quality or quantity, the standard-setting organization may authorize use of non-organic raw materials subject to periodic review and re-evaluation. These materials shall not be genetically engineered.

Processing methods should be based on mechanized, physical and biological processes. The vital quality of an organic ingredient shall be maintained throughout each step of its processing. Processing methods shall be chosen to limit the number and quantity of additives and processing aids. The following kinds of processes are approved, like mechanical and physical, biological, smoking, extraction, precipitation and filtration. Extraction shall only take place with water, ethanol, plant and animal oils, vinegar, carbon dioxide, nitrogen or carboxylic acids. These shall be of food grade quality, appropriate for the purpose. Irradiation is not allowed. Filtration substances shall not be made of asbestos nor may they be permeated with substances which may negatively affect the product.

As per USDA processed organic meat products are classified as follows:

- ☆ **100 percent organic:** Product must contain 100 percent organically produced ingredients, not counting added water and salt.
- ☆ **Organic:** Product must contain at least 95 per cent organic ingredients, not counting added water and salt.
- ☆ **Made with organic ingredients:** Product must contain at least 70 per cent organic ingredients, not counting added water and salt.
- ☆ **Less than 70 per cent organic:** Products with less than 70 per cent organic ingredients are not allowed to be labeled as organic and are only permitted to list those ingredients that are organic on the information/ingredient panel of the product.

## 7.1 Natural Sources for Organic Meat Preservatives

A number of different natural-based organic acids offer a significant improvement to food safety. One of the main reasons consumers choose organic foods is to limit their intake of manufactured ingredients. Most ingredients and technologies that serve as antimicrobials-ingredients that can improve the safety by either suppressing, inhibiting, or destroying any pathogenic bacteria-are not able to be used in products labeled 'natural' and 'organic. Fortunately, there are some compounds from natural sources that work as well as standard preservatives such as sodium nitrate and nitrite or sodium erythorbate. The problem is that it can take heavy doses of some natural ingredients to provide equivalent results. Cranberry concentrate is a very effective natural anti-microbial, but if you use enough to control the growth of bacteria, the meat turns cranberry red. The challenge is to ensure that organic meats are both safe and appetizing. Cherry powder combined with celery powder is already being adopted by processors that make organic and natural meats because of how effective these ingredients are in improving meat safety and quality.

## 8. Packaging and Labeling of Organic Meat

Being a highly perishable product, meat needs to be packaged appropriately to maintain its quality. Packaging plays an important role to protect, contain and promote the food products. While finalizing the packaging strategy for organic food, it is essential to understand the nature of products like their physical form (minced, whole cut, pieces, *etc.*), characteristics (moisture level, pH, fat content *etc.*) and stage of processing (convenience, semi-convenience, ready to eat, *etc.*). Problems of preserving food and transporting it to the final consumer in the best possible condition must be addressed. Basic principle of organic system is sustainability. Hence, packages used for containing organic meat must be safe, sourced in responsible way, environmental friendly and maximize the use of renewable material. Packaging material must not release any chemicals to meat products during storage and transportation.

Certified organic meat labels are applied to animals raised without antibiotics, growth hormones or genetically modified feed. These animals have access to pesticide/insecticide-free pastures, as well as access to fresh air, sunshine, water and exercise. The dams of organically raised animals must also have been feed organic feed for at least the last third of gestation. Feed destined for organically raised livestock must be 100 per cent organic, and it must be free from animal parts of any kind. The feed must not contain plastic pellets for roughage, or contain urea or manure – all allowable practices in conventional agriculture.

Providing information to consumers through labeling is also an important function of packaging. Organic labeling must display clearly the guideline followed for producing the product, certification details and the logo approved by the authorities. Effective labeling containing all the information necessary to consumers in attractive way will enhance the marketability of the products. As per NPOP guidelines, the person or company legally responsible for the production or processing of the product shall be identifiable on the label. Single ingredient products



may be labeled as “produce of organic agriculture” or a similar description when all standards requirements have been met. Mixed products where not all ingredients, including additives, are of organic origin may be labelled in that way. The word “organic” may be used on the principal display in statements like “made with organic ingredients” provided there is a clear statement of the proportion of the organic ingredients. An indication that the product is covered by the certification programme may be used, close to the indication of proportion of organic ingredients and where less than 70 per cent of the ingredients are of certified organic origin; the indication that an ingredient is organic may appear in the ingredients list. Such product may not be called “organic”. Added water and salt shall not be included in the percentage calculations of organic ingredients. The label for in-conversion products shall be clearly distinguishable from the label for organic products. All raw materials of a multi-ingredient product shall be listed on the product label in order of their weight percentage. It shall be apparent which raw materials are of organic certified origin and which are not. All additives shall be listed with their full name. If herbs and/or spices constitute less than 2 per cent of the total weight of the product, they may be listed as “spices” or “herbs” without stating the percentage. Organic products shall not be labelled as GE (genetic engineering) or GM (genetic modification) free in order to avoid potentially misleading claims about the end product. Any reference to genetic engineering on product labels shall be limited to the production method.

Today, many consumers are concerned about the meat they eat; hence, accurate labelling is important to inform consumer choice. In addition, accurate labelling is important to support fair trade. While regulations enshrined in national and international law underpins mandatory label information, unfortunately, regulations are not sufficient to prevent food fraud. To ensure adherence to regulations, and to enforce punitive measures when needed, robust analytical tests are required.

One restriction in production of organic meat is the use of veterinary drugs and rules dictate how and when such drugs may be used (Anon, 2008). Fluorescence microscopy (Kelly *et al.*, 2006) of cross sectional bone cuts can estimate the number of tetracycline doses administered to pig and chicken, and illegal serial or prophylactic dosing of tetracyclines can help verify whether the animal complies with the specified organic rules. This strategy is not conclusive as absence of tetracyclines is not a guarantee of organically produced meat.

One strategy is to explore the differences in animal fat from organically and conventionally raised animals. A gas chromatographic study of fatty acid methyl esters showed an increase in polyunsaturated fatty acids in organically produced lamb (Angood *et al.*, 2008), pig (Kim *et al.*, 2009), and broiler (Castellini *et al.*, 2002; Husak *et al.*, 2008) as compared to conventionally produced meats. However, fatty acid composition is also dependent on specific dietary intake such as pasture and concentrates (Pérez-Palacios *et al.*, 2009). Again, this strategy is not conclusive as a high level of polyunsaturated fatty acids could result from the specific dietary intake and not in from organically produced feed alone.

Another strategy could be analysis of isotopic composition. Stable ratio mass spectrometry of carbon, nitrogen, and sulphur isotopes succeeded in differentiating

between organic and conventional Irish beef (Schmidt *et al.*, 2005). The differences in isotopic composition in organic and conventional beef are partly due to the difference in the feed intake (grass or concentrate) (Schmidt *et al.*, 2005). However, the higher content of  $^{15}\text{N}$  in conventional beef compared with organic beef (Bahar *et al.*, 2008) might be a result of the mineral fertilizers applied to the soil where conventionally grown animals are fed (Watzka *et al.*, 2006).

**Table 19.1: Analytical Techniques Applicable in Authentication of Organic vs. Conventional Meat and Meat Products**

<i>Analytical Techniques</i>	<i>References</i>
Fluorescence microscopy	Kelly <i>et al.</i> (2006)
Gas chromatography	Angood <i>et al.</i> (2008); Castellini <i>et al.</i> (2002); Husak <i>et al.</i> (2008); Kim <i>et al.</i> (2009)
Stable ratio mass spectrometry	Schmidt <i>et al.</i> (2005)

Approved additives are allowed for use in manufacture of packaging films for packaging of foodstuffs. However, many of these are restricted for use in packaging of organic foodstuffs. The word restricted here indicates conditions and procedures for use shall be set by the accredited certification programmes. The following are approved additives under restriction, such as, 4,4'-Bis (2-benzoxazolyl) stilbene, 9,9-Bis (methoxymethyl) fluorine, carbonic acid, copper salt, Diethyleneglycol, 2-(4,6-Diphenyl-1,3,5-triazin-2-yl)-5-(hexyloxy) phenol, ethylene di-amine tetraacetic acid, 2-(2-Hydroxy-3,5-di-tert-butyl-phenyl-5-chlorobenzotriazole, 2-Methyl-4-isothiazolin-3-one, Phosphoric acid, trichloroethylene, polyesters of 1,2 propanediol and/or 1,3-and 1,4 butanediol and/or polypropyleneglycol with adipic acid, also end-capped with acetic acid or fatty acids C10-C18 or n-octanol and/or n-decanol, 1,1,1-trimethylolpropane, 3-hydroxybutanoic acid, 3-hydroxy-pentanoic acid and its copolymers.

## 9. Pest and Disease Control for Stored Meat and Products

Meat is a highly perishable food. Cold chain is mandatory for meat and meat products unless they are shelf stable processed products. Packed meat and meat products are frozen after its production till its consumption. Shelf life of products in refrigeration and freezing varies depending on types of products and the level of processing. Well packaged products can be stored at low temperature as per the product requirement and it is allowed under the organic production practices. However, care must be taken that there is no contamination of products during the period of storage of products.

Product integrity should be maintained during any storage and transportation and handling by use of the following precautions: a) Organic products must be protected at all times from co-mingling with non-organic products; and b) Organic products must be protected at all times from contact with materials and substances not permitted for use in organic farming and handling. Where only part of the unit is certified, other product not covered by these guidelines should be stored and handled separately and both types of products should be clearly identified.

Bulk stores for organic product should be separate from conventional product stores and clearly labelled to that effect. Storage areas and transport containers for organic product should be cleaned using methods and materials permitted in organic production. Measures should be taken to prevent possible contamination from any pesticide or other treatment not listed before using a storage area or container that is not dedicated solely to organic products. Besides storage at ambient temperature, the following special conditions of storage are permitted, like controlled atmosphere, cooling, freezing, drying and humidity regulation. Ethylene gas is permitted for ripening.

Any handling and processing of organic products should be optimized to maintain the quality and integrity of the product and directed towards minimizing the development of pests and diseases. Processing and handling of organic products should be done separately in time or place from handling and processing of non organic products. Pollution sources shall be identified and contamination avoided. Flavouring extracts shall be obtained from food (preferably organic) by means of physical processes.

Pests should be avoided by good manufacturing practices. This includes general cleanliness and hygiene. Treatments with pest regulating agents must thus be regarded as the last resort. Recommended treatments are physical barriers, sound, ultra-sound, light, and UV-light, traps (incl. pheromone traps and static bait traps), temperature control, controlled atmosphere and diatomaceous earth. A plan for pest prevention and pest control should be developed. For pest management and control the following measures shall be used in order of priority:

- ☆ Preventive methods such as disruption, elimination of habitat and access to facilities
- ☆ Mechanical, physical and biological methods
- ☆ Pesticidal substances contained in the Appendices of the national standards
- ☆ Other substances used in traps
- ☆ Irradiation is prohibited.

There shall never be direct or indirect contact between organic products and prohibited substances. (*e.g.*, pesticides). In case of doubt, it shall be ensured that no residues are present in the organic product. Persistent or carcinogenic pesticides and disinfectants are not permitted.

## **10. Inspection and Certification of Organic Products**

Certification helps in ensuring that products and its labeling regarding organic claims are authentic. Certification assures consumers of quality and authenticity of the product. Organic meat production consists of four different processes: production of organic feed, rearing of animals in farm, harvesting of meat in abattoir and processing of meat to value added products. All these entities must follow organic guidelines to get certification of final meat product. Producer interested in organic meat production must first study the relevant guidelines given under

NPOP and understand them. After studying the guidelines producer must align his production practices in line with the organic requirements. All the detailed production practices must be documented properly for inspection by the certifying bodies. Annual production plan must be written and submitted for accredited inspection agencies. Only accredited agencies can issue organic certifications. Inspectors appointed by accredited certifying agencies will visit the applicant's production units for inspecting and monitoring the compliance as per organic standards. Inspectors will visit the units to ascertain the compliance to set standards. After initial inspection, frequent visits are also made by the inspection agencies for monitoring. Usually conversion certificate will be given and after certain specified period final organic certification will be issued. Only certified producers can put 'organic' label on their products.

## **10.1 Identification of Meat Processing Treatments**

### **10.1.1 Irradiation is not Permitted in Organic Meat Products**

Electron spin resonance (ESR) spectroscopy has been found to be useful in detection of irradiated poultry meat (Marchioni *et al.*, 2005a; Marchioni *et al.*, 2005b) while gas chromatography can be used to measure volatile hydrocarbons and 2-alkylcyclobutanones present in irradiated poultry meat (Horvatovich *et al.*, 2000). Another possibility is the Comet assay (single-cell gel electrophoresis) (Ostling and Johanson, 1984; Singh *et al.*, 1988), which is based on electrophoresis of lysed cells embedded in agarose on a microscopic slide. The intensity of the Comet tail relative to the Comet head reflects DNA damage (Collins, 2004). The Comet assay finds application in the study of irradiation induced DNA degradation (Klaude *et al.*, 1996); however, the Comet assay cannot be used as a confirmatory tool as different treatments such as freeze-thaw cycles also cause DNA damage (Park *et al.*, 2000).

### **10.1.2 Meat Preparation (Baking, Cooking etc.)**

Production of Maillard compounds (Skog *et al.*, 1998) during heating could perhaps distinguish among different procedures used in boiled, fried, and grilled meat (Ballin, 2010). Maillard products from above certain temperatures, which, for example, make it possible to distinguish between long-term cooking at a low temperature from short term cooking at a high temperature. For instance, acrylamide is formed above 120 °C (Mottram *et al.*, 2002) and could be used as an indicator of products exposed to temperature above 120°C. HPLC (Eerola *et al.*, 2007; Paleologos and Kontominas, 2007) and LC-MS/MS (Granby and Fagt, 2004) can be used to quantify acrylamide.

## **10.2 Identification of Non-Meat Ingredient Additions**

### **10.2.1 Additives**

The vast number of organic compounds used as additives makes it difficult to present a detailed description of each. These organic compounds might be colorants, aromas, or preservatives. Colorants and some reducing chemicals can be used to increase fresh meat appearance. Aromas, such as smoke aroma can fraudulently be used instead of natural smoking of meat. Preservatives can be used to preserve

meat and make it appear fresh much longer than normal. The nature of the chemical compound determines the appropriate analytical technique. Since colour, aroma, and preservative relate to organic compounds added to the meat products both HPLC and GC methods may be appropriate.

Another group of additives are enzymes that take part in blood clotting. These can be used as blood-based binding agents and added to meat cuts or minced meat to form portions of desired mass and shape. In the binding process, thrombin cleaves fibrinogen to fibrinopeptides A and B. LC-MS/MS can be used to detect bovine (Grundy *et al.*, 2007) and porcine (Grundy *et al.*, 2008) fibrinopeptides A and B in concentrations down to 5 per cent.

### 10.2.2 Water

Addition of water is a real problem (Elliot, 2007) and regulations dictate the permitted amount of extraneous water in meat. A standard method to determine extraneous water in meat is to study the water/protein ratio. For instance, added water can be determined from a plot of water/protein ratio against extraneous water in boneless, skinless chicken breast (Anon, 2005). Water content can be determined by ISO 1442 (Anon, 1997), which describes the measure of mass before and after drying of meat, and protein content can be determined by ISO 937 (Anon, 1978), which describes an indirect protein determination method based on Kjeldahl analysis.

## 11. Marketing of Indian Organic Products: Status, Issues and Prospects

Organic animal husbandry requires most of the feed ingredients to be produced at the farm. Landless animal husbandry is discouraged. Absence of synthetic inputs for growth and disease control, and involvement of only organic ingredients reduces the growth rate of meat animals. Consequently, cost of production of the meat will remain high. This is true even for organic agricultural commodities wherein production level is compromised in the absence of use of fertilizers and pesticides. This leads to higher production costs and consequent higher price of commodities as compared to conventionally grown products. Willingness of consumers to pay higher price for health benefits is an important enabler for acceptability and marketability of organic products. Hence, growth of per capita income and affordability is expected to boost the sales

APEDA does not give any statistics about organic livestock product production or exports. In general, no significant effort is being made to tap the international demand for organic meat. Buffalo meat is the major component of meat exports from India and total buffalo meat exports in India stood at Rs. 26,457 Crores in 2013-14. Most of the buffalo meat is produced from spent buffaloes, which have completed their productive period. Rearing of buffaloes for meat purpose is not a widespread practice. Total worth of export of poultry products was Rs. 565 Crores in 2013-14. Due to short life cycle, there is a good scope for rearing broiler birds under organic system. As there is a huge demand for chicken and its products in domestic market due to high preference among consumers, scope for organic

chicken is high compared to other meats. In view of fluctuating price of chicken in Indian market organic chicken can be a good business proposition to entrepreneurs for sustained returns.

Consumers' interest in the authenticity of the foods they purchase is increasing, especially where it concerns more expensive 'value-added' products such as organic foods, fair trade products or products with a protected designation of origin (PDO). The scope for marketing organic food in India is vast and still not yet explored to its full potential. The following points can be taken into consideration while designing the strategies:

1. Literacy rate has gone up and people are more health conscious now. They think twice before buying a product. Likewise, agriculturists are now more literate and are ready to experiment with new generation of crops and improved farming methodologies.
2. Stressful lifestyle and so many diseases around have created a need for healthier and contamination free food.
3. Organic food market is still restricted primarily to metros and other major cities of the country.
4. Awareness about benefits of using organic food is very less.
5. Competitive pricing can really open a new avenue in the eatables and grocery section.

## 12. Opportunities for Tropical Countries

To remain relevant to the global economy, the developing countries too have to produce what the consumers are demanding globally. Therefore, it is a necessity to focus attention on this system of production. India certainly needs to move forward with its organic farming activities. This is what is rightly happening in India currently in case of high value commercial crops. Some South East Asian countries especially Malaysia and Thailand have already initiated research and development work in the area of organic animal husbandry, which may guide to other developing countries in the region. There is a huge demand for organic agricultural products in international market and domestic market is also slowly picking up due to increasing per capita income and living standards.

There are strong reasons for tropical countries to focus attention on organic livestock production. Some of the encouraging factors are: (i) Demand for organic livestock products is growing, (ii) European countries import significant proportions of organic meat and its products, (iii) Organic products tend to retail at a higher price than their conventionally grown/produced counterparts, mainly because of lower yield and certification costs and consumers are ready to pay a large premium price for organic food, (iv) Some developing countries do trade livestock products to developed countries, (v) Non-food livestock products, like organic textiles/garments, hides, wool offer hope for organic livestock production in tropical countries, (vi) Indigenous Technical Knowledge (ITK) available in developing countries may provide effective substitute for veterinary care, (vii) The use of agro-chemicals is almost nil in major parts of tropical countries offering ideal opportunity

of organic livestock production to grow, (viii) The native livestock breeds which are prominent in tropical countries are less susceptible to diseases and stress, need for allopathic medicines is very less, (ix) Grass or forest based extensive livestock production system prevalent in most parts of tropical countries offer a potential for conversion into organic animal husbandry, (x) Growing domestic market for organic products in developing countries may help to boost organic market at country, and regional level.

An overview of the situation offers that organic livestock production *per se* is yet to come up in most of the developing world except Latin American countries. The developing countries in Asia and Africa may draw lessons from these Latin American countries in coming years. Organic aquaculture (shrimp and fish), is emerging in China, Indonesia, Vietnam, Thailand, Malaysia and Myanmar for export and domestic market (Willer and Kilcher, 2011). This signals positively for the future growth of organic animal products.

### **13. Recent Trends and Future of Organic Meats and Processing**

There are several opportunities that may impact the future of organic agriculture, including organic meat and meat processing. Grazing animals in marginal land that is organic through wild collection is promising. It can increase income of livestock producers operating on these lands. Global acceptance of organic products like goat cheeses, meat and fiber is also an important opportunity for the future growth of organic markets. While energy and chemical costs are high, practicing sustainable organic meat production in general has an economic edge. Alternative medicine as a result of prohibition of restricted materials to treat diseases and illness can be promising.

A number of research opportunities are also apparent, the list include: emerging health issues, welfare and production constraints; epidemiological surveillance of key production diseases; breeding studies on disease resistance and commercial traits, nutritional deficiencies in organic systems, livestock breeding, biological control and the use of novel plants and plant extracts, development of animal welfare assessment methods, and development of welfare-friendly production systems.

Recently, ICAR-NRC on Meat in a collaborative project with ICAR-Central Research Institute for Dryland Agriculture (CRIDA) have been awarded with organic certification of sheep for meat purpose. Further ICAR-CRIDA is also providing organically certified fodder (hybrid Napier) in an area of 0.8 ha (Annual Report, 2017-18).

Animal health and welfare, with a greater emphasis on disease control and eradication will likely be the main challenge for organic meat production in the future. In order to accomplish goals of disease prevention, control and eradication, monitoring and evaluating of alternative health products will gain importance. To capitalize on the opportunity of using marginal land for organic meat production, converting hill and upland systems to organic production efficiently will most likely be required in the future. Due to the extensive use of grazing for organic meat production, mineral deficiencies as a result of soil characteristics and pasture management system should be important considerations (Qi *et al.*, 1993). In addition,

prevention of fraud and quality assurance for organic goat, sheep, dairy, meat and fiber products will continue to be a concern for consumers.

The interest of consumers in organic products mainly stems from health and environmental considerations. Consumers are concerned about the safety of what they eat and about the use of pesticides, hormones and other veterinary drugs in farming practice. Most of the meats produced in India are organic by default as the animals are grown traditionally with little or no synthetic chemicals. Moreover, the country has a wide range of local animal breeds, those are tolerant to disease. However, there is no active initiative from the public sector extension organizations to promote organic meat production. It is high time to establish better partnership and cooperation among livestock farmers, NGOs, certifiers, marketing people and the programs that will support organic meat production and ultimately it will contribute in improving the health status of population as well as agro-ecosystem. Certainly more research is needed in this field, but, at present, the advertising claims that consumption of organic meat rather than conventional meat can reduce the exposure to environmental hazards.

## **14. Conclusions**

Organic meat production is important for many reasons (less environmental impact, less use of energy, and other factors); however, even if the scientific literature in this field is scarce, there is no clear scientific evidence that organic meat can better protect consumers from chemical contamination than conventional meat, even if this is one of the major forces driving consumers to buy organic products. Organic meat production can improve animal welfare, protect the environment, and sustain rewarding rural lifestyles. Traditional and alternative medicine holds the promise for alternative prevention and treatment of animal diseases. The future of organic goat production is to continue searching for alternatives that are environmentally friendly, human health conscientious and animal considerate. Understanding organic farming from economic, ecological, and animal welfare perspectives will increase the likelihood of success. Organic meat production will have to strive for a more sustainable system than the conventional one, offsetting the increased costs of organic livestock production by higher product prices, and certified organic meat products that are healthier than those conventionally produced. To get certification for meat, feeding of certified organic feed ingredients is necessary. Hence, promoting and popularizing production of organic feed ingredients is prerequisite for development of organic meat sector. Community approach in organic animal husbandry can bring about a major advance in respect of organic meat production.

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