

## Review Article

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## Utilization of Spent Hen Meat for Soup: A Review

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Soup can be prepared from different food ingredient in different forms, of which dry soup mixes are more preferred by consumers because of its convenience, ease in preparation, shelf stability and popular appetizing capability. Spent hen meat can effectively be utilized in preparation of instant soup mix powder to overcome its poor acceptability and lowers remunerative prices. Method of drying and temperature applied during drying have key role on quality, shelf stability and consumer acceptability of the final product. Pretreatments like shredding, pressure cooking, proper drying, treating with flavouring, tenderizing and thickening agents may involve in further improvement of the product quality.

## Introduction

Soup is probably one of the oldest foods of human being, since it must have developed about the time when boiling was established as very fast form of cookery. Soups can be prepared of chicken, meat, sea food or vegetables and may be as a liquid or in dry powdered form. Although different in style, technically all the soup preparation involves

processes of boiling water extraction and heat induced composition interaction. The word soup comes from French word *soupe* (i.e. ‘soup’ or ‘broth’), which comes through Vulgar Latin word *suppa* (i.e. ‘bread soaked in broth’) from a Germanic source, from which also comes the word ‘sop’ to describe a piece of bread used to soak up soup or a thick stew. Chicken soup is simple to prepare, relatively cheap, nutritious, easily digestible

and highly cherished by young generation. Chicken soup is prepared by boiling the ingredients such as meat, vegetables and starch in hot water, until the flavour is extracted, forming a broth. For instance, it is regarded as the most ubiquitous medicinal soup in the world. Chicken soup has long been regarded as a remedy for symptomatic upper respiratory tract infections. Sipping warm soup can clear nasal passages, serving as a natural decongestant, which also relieves cold and flu symptoms. Chicken soup might have anti-inflammatory activity, namely, the inhibition of neutrophil migration (Barbara *et al.*, 2000) and could hypothetically lead to temporary ease from symptoms of illness (Rennard *et al.*, 2000). Normally soups are consumed before meals to stimulate the appetite and flow digestive juices in stomach. Chicken soup is often referred as "Jewish penicillin", "bohbymycetin" and "bobamycin" (Caroline and Schwartz, 1975; Saketkhoo *et al.*, 1978).

### **Spent hen meat**

The layer bird population of India was around 247 million in 2010 (Juse, 2012). Effective utilization of layer birds after the end of their productive life is one of the urgent requirements of the poultry industry as 30 percent of the poultry slaughtered are spent hens (Juse, 2012). Spent hen meat is obtained as a by-product of egg industry, which is high in fat and cholesterol content, tough, less juicy and poor in functional characteristics due to increased cross linking in collagen, resulting in lower remunerative prices as compared to broiler meat. However it is similar to broiler meat in nutritional quality (Chueachuaychoo *et al.*, 2011). Improved deboning techniques and modern methods of meat processing could enhance the quality and value of meat from spent hens leading to greater demands and better financial returns (Kondaiah and Panda, 1992). Since spent

layers are very cheap source of meat it can be used successfully in the formulation of many value added meat products (Kim and Ahn 1997). The toughness of spent hen meat can be overcome by utilizing it in different emulsion based value added products namely patties, sausages, nuggets, loaf etc. However, bony cuts such as neck, back, wings from spent hen are uneconomical to use due to lower meat yield and more labour requirement, so these can be directly used in preparation of chicken soup with minimal effort and cost. Studies have been conducted on different types of chicken soup like chicken whey soup (Chidandandiah and Sanyal, 2001), chicken soup (Shukla *et al.*, 2014) and instant soup mix (Gokulakrishnan, 2014). Meat from spent hen is a good protein source, highly enriched with omega-3 fatty acids and lower in cholesterol content which have been shown to have health promoting benefits (Chueachuaychoo *et al.*, 2011). Some of the pretreatments like cooking, shredding, treating with flavouring, tenderizing or other agents improve quality of dry spent hen meat products.

### **Instant soup mix**

Convenience food sector is one of the largest growing segments of food industry throughout the world. Dry soup mixes are well recognized convenience food item in the world food markets. Instant soup mixes are preferred more as dry soup mixes by consumers because of their convenience in preparation, shelf stability and excellent appetizing property. According to various estimates, soup market in India was in the range of INR 100-125 crores in 2010 (Juse, 2012). The category of ready to cook soup mixes formed 25 percent of the instant food segments (Juse, 2012). The major brands in ready to cook soup mixes in Indian market are Knorr (Hindustan Uniliver), Maggi (Nestle), Ching's secret (Capital Foods), Bambino

(Bambino Agro), Sil (Scandin Food), Campbell's (Weikfield Products) etc. Soups based on corn, mixed vegetables, leafy vegetables, mushroom and chicken etc. are common in India and abroad. Apart from good storage stability, nutritional and therapeutic properties, the increasing health consciousness amongst the population has led to increase popularity of instant soup mix all over the world. Dry soup mixes are prepared from several dried ingredients in addition to dry meat extract. Dry meat extract are processed by concentration (Kaisha, 1979), hydrolysis of chicken protein and chicken flavourings (Harris and Davis, 1993), vacuum condensation (Hiroyuki, 2002) etc. Preparation of the chicken soup mix by deboning and mincing of pressure cooked meat increases the chance of post-cooking microbial contamination while further cooking of meat with bone increase the fat content of the final product (Sachindra *et al.*, 2007).

### Shredding

Shredding is necessary to cut the meat into fine slices for fast and uniform drying and ensuring better shelf life. It is better to soft freeze the meat to give it body and minimize fluid loss during slicing and then cut sheets of the desired size and shape (Shank and Park, 1966). Cooking the meat and shredding with fork or hands is another method (Juce, 2012).

### Cooking

Cooking is one of the most important steps in preparation of any chicken product from food safety point of view. Pressure cooking is considered as best preprocessing method for preparation of dehydrated chicken soup mix in respect to sensory attributes of resultant product (Bhatta *et al.*, 2007). Pressure cooking of chicken tenderizes and intensifies its flavor better than any other cooking

method (Juce, 2012). The most desirable physico-chemical properties of dehydrated spent hen meat mince could be preserve up to 60 days storage period at ambient temperature by precooking spent hen meat mince treated with 2% spice mix (Kharb *et al.*, 2008). Precooking the meat before drying greatly reduces, but does not destroy its lipolytic activity (Lawrie, 1985). Since aqueous liquid exuding from the meat during the precooking period contains various soluble substances, it must be returned to the cooked meat before rehydration commences to retain the full meat flavor and nutritive value of the fresh commodity (Lawrie, 1985).

### Drying

Drying is one of the oldest methods of food preservation and processing (Ayanwale *et al.*, 2007; Vadivambal and Jayas, 2007). It is a process in which water is removed from a material by evaporation or sublimation (Lewicki, 2004). In physical terms, drying is the lowering of the water activity ( $a_w$ ) of food which inhibits the growth of microorganisms. Drying has the advantage of being the cheapest and easiest method of preservation requiring very less storage space compared to the raw meat or other food products, allowing easy transportation. Hot air drying, heat pump drying, solar cabinet drying, freeze drying, microwave vacuum drying etc. are some of the commercial methods for food dehydration (Gaware *et al.*, 2010). Of these all except hot air drying and solar drying are expensive techniques. It is possible to obtain freeze dried poultry meat that looks and tastes similar to fresh poultry (Babic *et al.*, 2009), but it is an expensive and energy intensive process. Freeze drying produced porous dehydrated diced chicken with excellent rehydration properties than air drying (Farkas and Singh, 1991). Sun drying of meat under hygienic conditions could be an alternative of oven drying in the hot humid tropical

environment (Ayanwale *et al.*, 2007). Drying of cooked minced meat under carefully controlled conditions resulted in a product which was almost indistinguishable in flavor and texture from raw minced meat in fully cooked state (Dunker *et al.*, 1945 and Sharp, 1953). When fresh meat is dried directly in hot air, the surface dries first, interfering with subsequent evaporation of moisture from the interior of meat. This surface drying or case hardening produces a product which is often gummy in texture and with poor rehydration properties (Shank and Park, 1966). Higher temperature drying causes lower sorption capacity in dried meat products (Iglesias and Chirife, 1976).

### **Flavouring agents**

Flavour is one of the most important sensory attributes of chicken soup for consumer acceptability. Among non-vegetarian flavours chicken soup is most popular (Juce, 2012). According to industry experts, innovation will be the key to expansion in this category, and it will be driven by availability of more flavours and variety (Juce, 2012). Incorporation of flavoured dehydrated chicken shreds in these soup mixes can enhance their attraction as well as nutritive value at a minimal cost. Ginger has been proved to have some antioxidant and tenderizing properties. Ginger, garlic, mint etc. are common flavours agents preferred in chicken products especially by Indian consumers. Apart from the taste and aroma, these herbal extracts also improve shelf life and provide health benefits due to bacteriocidal, bacteriostatic or antioxidant properties (Sherwin, 1990). Fresh garlic and garlic powder, through their combined antioxidant and antimicrobial effects, are potentially useful in preserving meat products against lipid oxidation and microbial growth during storage (Sallam *et al.*, 2004). Antioxidant activity of mint extract as a

natural antioxidant is comparable to the synthetic antioxidant, butylated hydroxytoluene (BHT) in terms of TBARS values (Kanatt *et al.*, 2005). As decontaminating agent, essential oils of ginger and aqueous extract of garlic (1:150) at 100% concentration is effective, causes significant reduction in microbial load of chicken meat (Sudarshan *et al.*, 2010). Ginger extracts marination could retard lipid oxidation and enhance the proteolysis of Muscovy duck breast muscle (Tsai *et al.*, 2012).

### **Tenderizing agents**

Tenderness is one of the most important eating quality attributes. The overall impression of tenderness to the palate involves three aspects: the initial ease of penetration of the meat by the teeth, the ease with which the meat breaks into fragments and the amount of residue remaining after chewing (Lawrie, 1985 and Maiti *et al.*, 2008). In order to improve the tenderness of meat, a number of tenderizing methods have been tried as ante mortem or postmortem treatments. Among the post mortem methods treatment with chemical and enzymatic tenderizers is commonly practiced. Enzymatic tenderizers are proteolytic enzymes such as papain, bromelin, ficin etc. Among 15 inorganic salts lithium, magnesium, and sodium salts were found to be most effective for increasing tenderness of spent hen meat (Palladino and Ball, 1979). Alkaline phosphates increase the water binding capacity of meat, reduce shrinkage during processing, retard development of oxidative rancidity and improve texture (Hedrick *et al.*, 1993). Sodium tripolyphosphate (STPP) is most commonly used alkaline phosphate in food industry, attributed to increase in water holding capacity through a concomitant rising of the pH (Lawrie, 1985). NaCl and STPP were more effective to reduce TBARS values

and extend shelf-life of cooked spent hen muscles than in raw samples during chilled storage (Chueachuaychoo *et al.*, 2011). Polyphosphates significantly decreases shear force value of meat (Xu *et al.*, 2009). Unused tough meat can be successfully utilized as well accepted one with application of natural tenderizers like papaya, ginger, kachri and fig (Maiti *et al.*, 2008). Improvement in tenderness and overall qualities of goose breast meat is possible by using plant proteolytic enzymes from papaya (0.12% papain), pineapple (6% pineapple juice) and ginger rhizome (4% ginger juice) (Gao *et al.*, 2011).

### **Thickening agents**

Suitable body or viscosity is an important factor in the acceptability of dry soup mixes (Nair and Warren, 1973). Lack of suitable body, even in clear soups results in watery consistency. For this reason, starches and flours play an important role in soup mix formulation. All thick soup mixes contain certain proportion of flour or starch in their formulation as a thickening agent which provide body to the soup. Among them, the important ones used are corn flour, potato starch, wheat starch and potato flour. Besides them, arrowroot starch, rice flour and locust bean gum are occasionally used. Corn starch is optimal thickening agent, providing body to chicken soup without suppression of salt taste and greatest enhancement of chicken flavour and overall flavor (Rossett *et al.*, 1996). Corn flour/starch was also used as a thickening agent for preparation of chicken soup and fish soup mix by various researchers (Chacko *et al.*, 2005; Gadekar *et al.*, 2009; Rahman *et al.*, 2012). Incorporation of potato flour in food products like *dalia* and tomato soup results in to very good sensory scores without deterioration in colour, appearance and texture (Nanda and Khanna, 1988).

Vegetables like carrot, bean, pea etc. are known to carry several beneficial properties which provide numerous health benefits to consumers. Carrots are perhaps best known for their rich content of antioxidant like beta carotene. Carotenoids represent a large group of phytochemicals that may contribute to health and disease prevention (De Nardo *et al.*, 2009; El-Sohemy *et al.*, 2002). Incorporation of bean and pea in chicken soup is health beneficial for consumers due to presence of several vitamins and minerals.

In conclusion, chicken soup is simple to prepare, relatively cheap, nutritious, easily digestible meat product with medicinal property and excellent consumer acceptability. Instant soup mix powders are well recognized food item in the world food markets because of their convenience in preparation, shelf stability and appetizing capability. In spite of good nutritional quality, spent hen meat has poor acceptability and yield lowers remunerative prices. Thus effective utilization of spent hen meat is one of the urgent demands of the poultry industry. Utilization of nutritious, easily available and economically viable spent hen meat in instant soup mix powders formulation can overcome the problem of lower acceptability due to its toughness besides fulfilling consumer demand for non-vegetarian soup. Pretreatments like shredding, pressure cooking, proper drying, treating with flavouring, tenderizing and thickening agents may involve to claim the product as better shelf stable, health beneficial, nutritious and popular appetizer.

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