

PRIMARY PROCESSING OF COCOA

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ABSTRACT

Cocoa is an important cash crop in many tropical countries. Cocoa beans are mainly consumed in chocolates and widely used in beverages, cosmetics and pharmaceuticals. The quality of cocoa beans is highly dependent on processing technologies and storage conditions. Fermentation and drying are the important operations in primary processing in order to maintain the quality standards of cocoa. An investigation was undertaken to study the primary processing of cocoa beans;

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INTRODUCTION

Cocoa is an important cash crop in many tropical countries. Cocoa trees grow in a limited geographical zone, of approximately 20 degrees to the north and south of equator (Buijsse et al., 2006). The original home of cocoa trees is central and south America (Acquaah., 1999).

Cocoa beans come from the seeds of the cacao trees, which are native to the tropical forests of the Amazon. Cacao trees produce 20 to 30 pods a year, and each of these pods contain 25 to 40 seeds that are surrounded by a mucilaginous pulp. Each pod produces about 0.043kg of fermented and dried cocoa beans. Today, it is more than two thirds of the world's cocoa beans are produced in West Africa, and Ghana specifically, earned in 2005 about 60 per cent of its foreign income from export of coca beans (Hartemink., 2005). In the year 2008-2009, Ghana produced 6, 62,000 tonnes of cocoa beans, equal to 19 per cent of World cocoa bean production. This makes Ghana the second largest cocoa bean producer in the world. Ghana's neighboring country, Cote d'Ivoire, the largest world producer, produced 12, 22,000 tonnes of cocoa beans in 2008-2009 (ICCO., 2009).

Cocoa beans is mainly consumed as chocolates and widely used in beverages, cosmetics, pharmaceuticals and toiletry products. It is also associated with many health benefits (Porter., 2006; Taubert et al., 2007).

METHODOLOGY

The small farm holders in West Godavari district and parts of Anantapur district near to Madakasira produce cocoa beans, and the primary processing methods are simple, inexpensive but not scientific, particularly drying in rainy season. However, further research is needed to promote development and practice of improved primary processing of cocoa beans.

RESULTS AND DISCUSSIONS

This work aims the primary processing chain of cocoa beans.

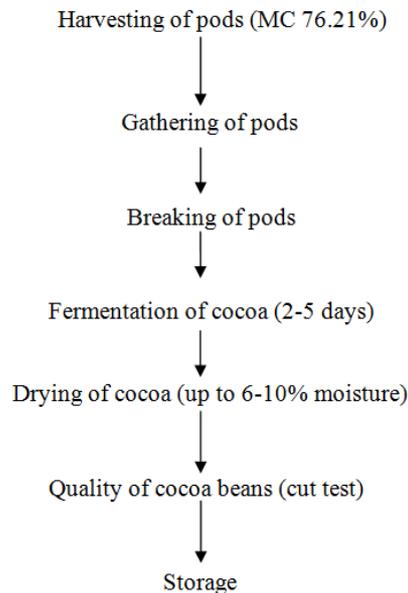


Figure 1: Process Flow Chart of Cocoa Pods

Steps Involved in Primary Processing

- **Harvesting**

Pod development of cocoa from flowering stage to full maturity stage takes around 5-6 months. For primary processing only fully ripen, healthy and undamaged pods are selected and harvested. Selected pods are separated from the tree with special knife fixed to a long bamboo and care is taken while harvesting not to damage the pods and the flowers of the tree.

- **Pod Breaking**

Pod opening or breaking is an important minor operation as remaining operations in processing depends on this operation. This operation consists of removing the beans by breaking the pods without damage of beans and these removed beans are wet converted into dry beans.

This breaking of pods is done either by small cutlass or wooden billet. The pod is broken into half in longitudinal axis and bean is removed. Before selecting the beans for further processing, care should be taken not to select the beans of germinated, black or diseased beans.

The fermentation takes place during the time interval between the harvesting and breaking of the pods which results in the development of flavor. In general the pods are harvested at the starting of the week and the pod breaking can be followed at the end of the week which means the minimum time interval is around 5-6 days. When the pod is broken the cocoa inside it is wet which is to be transported to fermentation within 24 hours of separating the cocoa in order to avoid the problems during fermentation. If the time interval between the harvest and pod breaking is more than six days than it affects the flavor of cocoa which ultimately results in the quality of cocoa (Clapperton *et al.*, 1994)

- **Fermentation**

Fermentation is process of removal of pulp and waste from the cocoa fruit. Fermentation of cocoa can be conducted in a number of manners. The ways it can be fermented include in baskets (**Plate 1**), in boxes (**Plate 2**), and in a heap covered with banana leaves (**Plate 3**). In all cases, the bottom and sides of the box or basket should be covered with banana leaves, however bananas leaves on the bottom should be not too thick and should be also perforated by a knife to make sure that the liquid from the pulp will be drained. Insufficient drainage of pulp will result in a bad fermentation.

The Banana leaves are covered completely on the cocoa inorder to prevent it from drying out in basket fermentation. This helps in insulation to hold heat as there is no contact with external climate. Heap fermentation is the simplest of all and does not require a farmer to have to construct fermentation boxes. This type of fermentation is the most common type conducted in foreign countries.

The box fermentation is the most common type of fermentation conducted around the world. Fermentation boxes should be constructed of a suitable local hardwood in dimensions 0.6 m x 0.6 m x 0.6 m. The leaves which used to cover cocoa are should be designed so that the heat evolved during fermentation is conserve and the liquid which produced because of heat during fermentation can befreely drained out.



Plate 1: Basket Fermentation of Cocoa Beans



Plate 2: Box Fermentation of Cocoa Beans



Plate 3: Heap Fermentation of Cocoa Beans

- **Drying**

The moisture content at the end of the fermentation in the whole bean is approximately 60 per cent which is to be reduced to 7 – 7.5 percent so that there is no chance for the growth of mould during storage and it can be sold or transported.

The drying rate of cocoa affects the final quality. Too rapid drying rate also results in the hardening of the shells and formation of acid in the beans. Drying can be done naturally or artificially. The natural drying can be sun drying on wooden floors where as the artificial drying is by using artificial dryers.

- **Polishing**

In order to increase the appearance of the beans it is polished during drying operation. The beans are polished by using rotary type dryer or a special polishing machine which is similar to grain mixer when the shell of the cocoa is hard. Polishing helps in protecting the fungal attack during storage and helps in improving the external appearance.

- **Cleaning and Bagging**

After drying and polishing, the beans are cleaned of any extraneous matter and packed in food safe jute bags. New food safety requirements dictate that “food safe “bags whose fibers have been created with vegetable oil must be used to store cocoa beans. These bags are only used once and must also be clean, sound sufficiently strong properly sewn.

- **Grading**

Grading is done via a mechanical grader which uses a gradation of different sized mesh sheets around a rotating cylindrical with helical screw inside to convey the wheels. During grading, first broken pieces of beans and shell fragments are removed, next flagged beans are removed, then small beans and finally large grade I beans. There are 3 grades of cocoa beans established by the Cocoa and coffee Industry Board: Grade I, Grade II and defective. Grade I has a bean count of 80/100g, less than 1 per cent commercial defects (that is. in order of importance, mouldy, over-fermented smoky, under –fermented or insects infested beans). Grade II accounts for just 5 per cent of the total cocoa crop and has a bean count of 85/100g with less than 4 per cent commercial defects. Defective beans are not exported.

- **Storage**

Storage is an important operation from harvesting to drying. Storage helps to maintain optimum quality. During storage, humidity can be controlled to avoid re-humidification of the cocoa beans. Proper storage helps in reducing the mould growth.

Products of cocoa

The cocoa tree is a tropical plant grown in hot, rainy climates with cultivation concentrated on a narrow band of no more than 20 degrees north or south of the equator. Although it is best known as the principal ingredient in chocolate, there are actually four intermediate cocoa products that may be derived from cocoa beans, cocoa liquor, cocoa butter, cocoa cake and cocoa powder.

CONCLUSIONS

India produces 0.5 per cent of world total Cocoa bean production. The production of cocoa beans in Andhra Pradesh is 11,820 tonnes in 2011-2012. Drying is the important post harvest operation with the maximum losses occurring during this period.

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