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IMPLEMENTATION OF HACCP SYSTEM TO IDENTIFY FOOD SAFETY HAZARDS ON ORANGE SQUASH PRODUCTION LINE

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ABSTRACT

The quality and security of horticultural items has dependably been the matter of great worry in India. The Hazard Analysis and Critical Control Points (HACCP) is perceived as a powerful tool used to prevent failures in Food Safety. To guarantee and advance effective foundation and usage of the HACCP framework in the Fruit Beverages Industry in India, the paper dissected potential risks in the Orange Squash Production line and characterized the basic control focuses. In the mean time, the table of HACCP design was set up.

Keywords: Hazard Analysis and Critical Control Point(HACCP), squash, quality

INTRODUCTION TO HACCP

Hazard Analysis Critical Control Point, or HACCP, is a fully operational matrix adopted for the protection of food by assessment and control of various physical, chemical and biological hazards in production processes that can make the food unsafe, and designs actions to be undertaken to reduce these risks to a safe level. The HACCP framework was propelled openly in 1971, and is intended to recognize and control risks that may happen anyplace in a food production operation. HACCP presentation has flagged a move in accentuation from review and testing of asset serious finished result to preventive controls risks at all phases of food production. It concentrates on avoidance of hazards as opposed to completed item review. This is accomplished by evaluating the characteristic hazards inferable from an item or a procedure and after that deciding the vital advances that will control the distinguished hazards. HACCP is a science-based framework used to guarantee that sustenance wellbeing hazards are controlled to keep risky food from achieving the customer (Bardic, 2001; Mortimore and Wallace 1997; Morris, 1997; IFST, 1998; Smukowski, 1996).

In India fruit squash and other fruit beverages market have experienced a high growth trajectory because of easy availability and convenience. They are gradually cementing their places in the urban households. Fruit Squash is consumed after blending it with a particular amount of water or carbonated water before drinking. It may also be used to prepare a cocktail by combining it with some alcoholic beverage. Generally citric fruits (especially orange, lime and lemon) or a blend of

fruits and berries are commonly used as the base of squash . Squash is set up by consolidating one section focus with four or five sections water (carbonated or still).

Fruit Part- min 25 %
Total Soluble Solids- min 40-50%
Acid- 1%
Preservatives- 350 ppm sulphur dioxide or 600 ppm sodium benzoate.

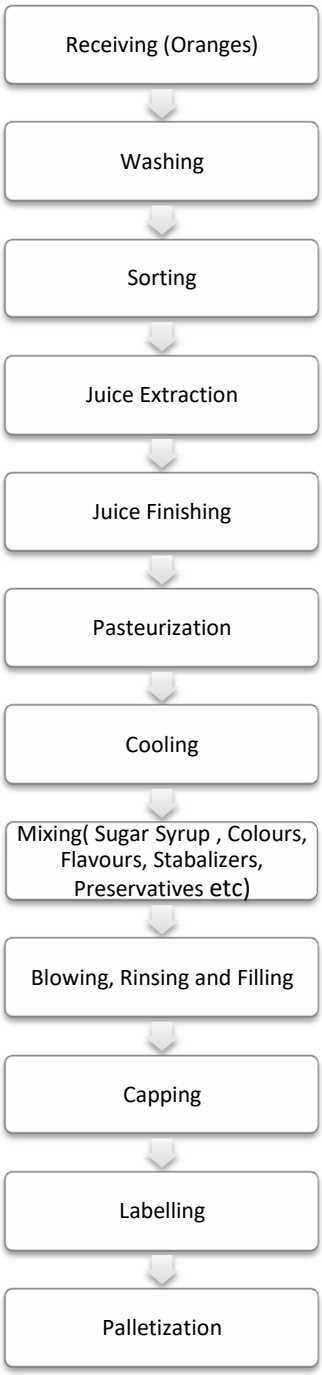
MATERIAL AND METHODS

Orange squash is a RTS beverage essentially prepared using raw materials such as oranges, sugar, citric acid and other chemicals and so on. after careful checking as per the specifications. Oranges are procured and their physical characteristics such as weight of fruit, diameter, thickness of peel etc are determined. Oranges are further washed using water at 50°C. After sorting the desirable raw material the oranges are send further for juice extraction. The juice obtained is then finished to separate juice from pulp. Pasteurization of juice is done at 90°C for 10 sec and is then immediately cooled to 35 – 40°C. sugar syrup solution is added and the final product is filled and sealed.

Recipe for Orange Squash

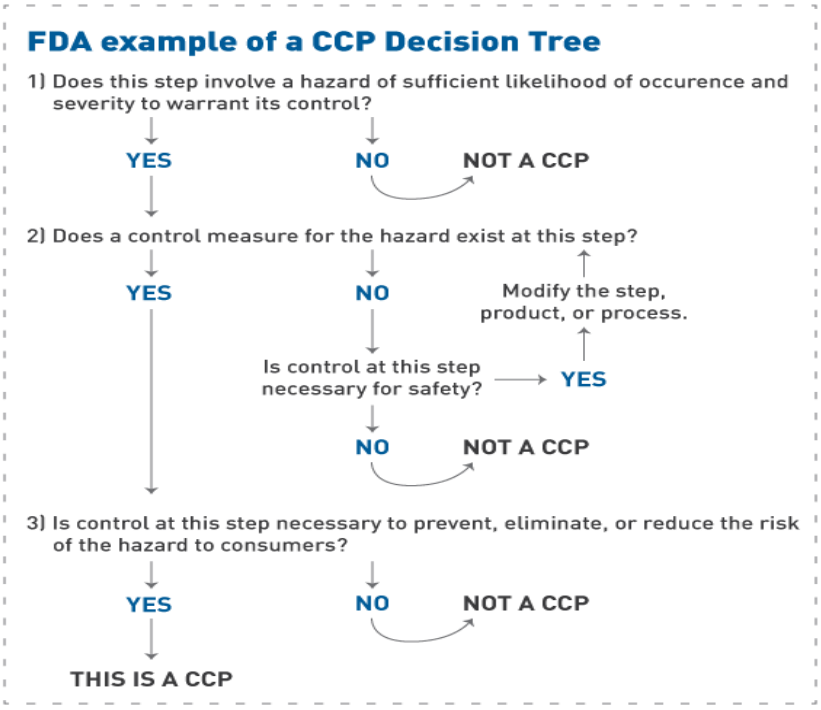
FRUIT	JUICE/PULP (kg)	SUGAR(kg)	WATER(l)	CITRIC ACID(g)	KMS (g)	SOD. BENZOATE(g)	COLOUR/ ESSENCE
Orange	1	1.8	1.2	25-30	3	Not added	Optional

FLOWCHART FOR PROCESSING OF SQUASH



- **Hazard Analysis:** a process flow diagram is put up indicating all the steps from raw material collection to final product. Analysis initiates after careful inspection of the entire process .We identify sources and activities in process which may impact the process. After that we rank them on the basis of degree of severity and frequency of occurence, the points with the maximum severity are declared critical points hence controls are formulated to limit their effect. Significance of each hazard is determined by the Hazard Analysis Table.

- **Determination of Critical Control Points (CCPs) and development of control measures:** Using the decision tree decisions are taken for the establishment of CCP'S.



Using the Hazard Analysis Worksheet 3 CCP'S were identified. These were washing of raw material (oranges), Pasteurization and Filtration of sugar syrup.
After the detailed Hazard Analysis these steps were subjected to the following control measures:

Control Measures

1. Stop the machine belt. Adjust boiler and pipeline to achieve the critical limits and adjustment the belt speed

2. Separate and hold the unsafe product for evaluation and destroy, or divert them for non food use

3. Adjustment of the pasteurizer's (temperature and flow rate) to obtain the critical limits

4. Reject filtration screen if they are not accompanied with guarantee from suppliers.

- **Defining critical limits and monitoring procedures for every CCP:** sometimes more than one monitoring techniques may be required to ensure the reliability of the process. Therefore many different methods were used in our study. During the process of washing, pasteurization time and temperature should be maintained within the limits.

- **Establishment of corrective actions and verification procedures:** The HACCP plan ought to incorporate an arrangement of activities to be taken after when the checking estimations demonstrate that it is possible that one CCP or a few CCPs are not under control so as to keep away .Check methods are vital so as to guarantee that the HACCP design is working viably. Considering the crude materials from providers, the particulars are recommended for check purposed.

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HAZARD ANALYSIS WORKSHEET

(1) **List each Ingredient/ step in processing**	**(2)** **Identify potential hazards for each ingredient or step**	**(3)** **Does any potential food-safety hazards require preventive control? (Yes/No)**	**(4)** **Give justification for your decision for Column 3**	**(5)** **If yes then What preventative control measure(s) can be applied to prevent/ reduce/ eliminate the hazard?**	**(6)** **Is this step a Critical Control Point? (Yes/No)**
Receiving (oranges)	**Biological –** Pathogens (Bacteria: *Salmonella* spp., *Listeria monocytogens, E. coli O157:H7* are the pertinent microorganisms present on the surface of oranges. Moulds and yeasts: *Aspergillus*	Yes	Medium likelihood but high severity	Controlled at Pasteurization	No

	flavus and *Rhodot orula mucilaginosa*)				
	Chemical – a. Pesticides (Imazalil, Orthophenylphena te, thiabendazol)	No	Minimum likelihood		No
	b. Mycotoxins – Aflatoxins, Alternariol (AOH) and Alternariol monomethyl ether (AME)	Yes	Medium likelihood but high severity	Controlled at Pasteurizat ion	No
	Physical – Dirt, stone, woodchips	Yes	If present can cause wear and tear to the machines	Controlled at washing	No
Washing	**Biological –** Contamination with pathogens such as *Salmonella* spp. and *E. coli O157:H7* from washing water	No	Not likely to occur due to SSOP's for water quality		No
	Chemical – Organochlorines, Organophosphates , Synthetic	No	Not likely to occur as treated potable		No

	pyrethroids and Herbicides from washing water		water is used		
	Physical – Dirt, stone, woodchips from procured oranges	Yes	If present can cause wear and tear to the machines	Bubble washing with pressurized water	Yes
Sorting	**Biological –** None	No			No
	Chemical – None				
	Physical – None				
Juice extraction	**Biological –** None	No			No
	Chemical – None				
	Physical – None				
Juice finishing	**Biological –** None	No			No
	Chemical – None				
	Physical – None				
Pasteurization	**Biological –** Pathogens (Bacteria: *Salmonella* spp., *Listeria monocytogens, E. coli O157:H7* are the pertinent microorganisms present on the surface of oranges. Moulds and yeasts: *Aspergillus flavus* and *Rhodot*	Yes	Medium likelihood but high severity	Heat treatment given to orange juice to kill the pathogenic microbes	Yes

	orula mucilaginosa)				
	Chemical – None	No			No
	Physical – None	No			No
Cooling	**Biological –** None	No			No
	Chemical – None				
	Physical – None				
Mixing	**Biological –** None	No			No
	Chemical – None				
	Physical – None				
Receiving (preservative, colour, flavor, stabilizer, vitamin C and acidity regulator)	**Biological –** None	No	Not likely to occur Because certification of quality		No
	Chemical – None				
	Physical – None				
Receiving (sugar, water, citric acid,)	**Biological –** Contamination with pathogens such as *Salmonella* spp. and *E. coli O157:H7* from water	No	Not likely to occur due to SSOPs for water quality		No
	Chemical – Organochlorines, Organophosphates , Synthetic pyrethroids and Herbicides from	No	Not likely to occur as treated potable water is used		No

	water				
	Physical – Dirt, husk, straw and other visible foreign materials	Yes	Contamination and deterioration in quality of the product	Controlled at Filtration	No
Heating	**Biological –** None	No			No
	Chemical – None				
	Physical – None				
Filtration	**Biological –** None	No			No
	Chemical – None	No			No
	Physical – Dirt, husk, straw and other visible foreign materials	Yes	Contamination of the product from foreign materials present in the sugar	Separation of foreign material from syrup by passing through filter medium	Yes
Receiving (preforms and caps)	**Biological –** None	No			No
	Chemical – None				
	Physical – None				
Blowing, rinsing and filling	**Biological –** Contamination with pathogens such as *Salmonella* spp.	No	Not likely to occur due to SSOP (Sanitation		No

	and *E. coli O157:H7* from rinsing water		Standard Operating Procedure) for water quality		
	Chemical – Organochlorines, Organophosphates, Synthetic pyrethroids and Herbicides from rinsing water	No	Not likely to occur as treated potable water is used		No
	Physical – None	No			No
Capping	**Biological –** None	No			No
	Chemical – None				
	Physical – None				
Labeling	**Biological –** None	No			No
	Chemical – None				
	Physical – None				
Palletization	**Biological –** None	No			No
	Chemical – None				
	Physical – None				

HACCP PLAN

Critical Control Point (CCP)	Hazard(s)	Critical Limits	Monitoring				Corrective Action	Verification	Record Keeping
			What	How	Frequency	Who			
Washing	**Physical –** Dirt, stone, woodchips from procured oranges	Temperature of water 50-55°C contact time 20-25 s	Temperature of water Oranges flow rate	Using temperature monitoring recorder Measure flow rate by visual inspection	Continuous monitoring Hourly	Operator in charge Operator in charge	Stop the belt. Adjust boiler and pipeline to achieve the critical limits By Adjusting the belt speed	Check the accuracy of the temperature recording device daily Calibrate the thermometer annually Weekly review of monitoring and verification procedures	Operator's log Temperature records

Pasteurization	**Biological –** Pathogens (Bacteria: *Salmonella* spp., *Listeria monocytogens, E. coli O157:H7* are the pertinent microorganisms present on the surface of oranges. Moulds and yeasts: *Aspergillus flavus* and *Rhodotorula mucilaginosa*)	temperature of juice- min 90°C contact time - 10 s	Temperature Stream rate	Using Temperature monitoring recorder Visual check of positive displacement pump setting	Continuous monitoring with visual check (hourly) Daily	Operator in charge Operator in charge	Separate and hold the unsafe product for evaluation and destroy, or divert them for non food use Adjust pasteurizer (temperature or flow rate) to achieve the critical	Check the accuracy of the temperature recording device daily Calibrate the thermometer annually Flow rate test and resealing of pump speed monthly Weekly review of monitoring and verification procedure	Operator's log Temperature records

							limit	s	
Filtration	**Physical –** Dirt, husk, straw and other visible foreign materials	Pore size of screen should not be more than 0.1 mm	Certificate of guarantee	Inspection and verification	At the time of procurement	Manager at receiving desk	If the screen doesnot come with suppliers guarantee then reject it	Weekly review of monitoring and verification procedures Annual audits of the supplies	Supplier guarantee Receiving log Supplier audit report