

# Spray Drying parameters for the maximum recovery of fruit Powder from different tomato varieties grown in Dindigul District

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**Abstract-** Spray drying is one of the effective post harvest technology used for making powders from fruits and vegetables. Natural tomato powder from freshly harvested tomatoes procured from the Dindigul Farmers Association was tried to study the essential parameters for spray drying. The Spray drying behavior of PKM1, CO-3 and Ruchi tomato juices at different inlet and outlet temperature levels using the ACMEFIL Spray dryer, located at Gandhigram Trust was studied. The observation parameter includes different inlet and outlet temperature settings and the feed flow rate of juice in to the atomizer. With the addition of malt dextrin 8% and feed rate of 80ml per minute controlled by the peristaltic pump, having inlet air temperature as 160oC,164oC and 162oC with constant outlet temp of 90oC was observed as the optimum conditions for the maximum recovery of tomato powder from the above three varieties.

**Index Terms-** spray drying; tomato powder; atomizer; optimum temperature

## I. INTRODUCTION

Tomato (*Solanum lycopersicum* L.) is widely used in Indian kitchens and is rich in Vitamin C, Potassium and antioxidant lycopene. Tomato is being grown in all the blocks of Dindigul district of Tamilnadu and it is quite unfortunate that most of the farmers getting lower prices especially during the months between February to June, due to higher production with the low price range of Rs.2 to Rs.5 per kg. Among several processing methods spray drying is the efficient mode of preservation of tomato powder. Tomato powder is readily marketable due to ease in packaging, transportation and utilization in different ready to eat food preparations with extended storage life. Tomato and tomato products are the major sources of lycopene and are considered to be important contributors of carotenoids in human diet (Tapiero et al. 2004; Goula and Adamopoulos 2005). Though very few tomato processing units are available in India, tomato powders are widely used in soups, Instant sauce premixes, ketchups, Sambar and Rasam mix, Puddings, Bakery Products, Health Foods, Sweets, Biscuits, Baby foods, Confectioneries, Snacks etc.

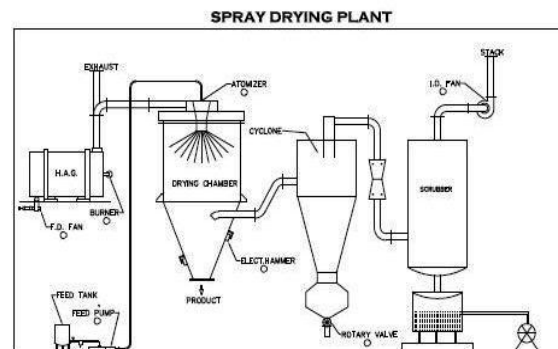
Spray-drying is defined as the transformation of liquid state feed into a dried particulate form. This is achieved by atomizing the fluid into a drying chamber, where the liquid droplets are passed through a hot-air stream (Masters, 1991). It also provides the advantage of weight and volume reduction. Parameters like concentration of juice, addends, feed flow rate

and also the inlet / outlet air temperatures have a significant role in the yield of Fruit powders. Fruit powder is hygroscopic and requires drying agents such as starch, Arabic gum and malt dextrin for making spray dried powders (Jaya and Das, 2004). Gupta used liquid glucose as addend to produce free flow orange fruit powder. Bhandari *et al.* found that wettability of fruit powder with lower inlet air temperature was better than higher inlet air temperature. The optimum conditions like feed flow rate of 15ml/minute; inlet air temperature of 130<sup>o</sup>C and outlet air temperature of 85<sup>o</sup>C have been obtained using liquid glucose as addend for recovery of Orange fruit Juice powder (Chegini and Ghobadian, 2007). Fruit powder is hygroscopic and requires drying agents such as starch, Arabic gum and malt dextrin for making spray dried powders (Jaya and Das, 2004).

## II. MATERIALS AND METHODS

**Materials:** Freshly picked PKM1, Co3 and Ruchi tomato varieties which are ripe and clean obtained from oddanchatram and Athikombai Farmers club with TSS values of 6, 5.6 and 5.27, pH values of 4.1,4.9, 4.5, acidity range of 0.4, 0.38 and 0.33. Tomatoes were exposed to hot water kept at 50<sup>o</sup>C before extracting the juice using a fruit pulper. The aqueous extract was then filtered and utilized as sample. Dextrin (Commercial grade) supplied by Udhayam Scientific Company @Rs.30/kg was used @ 80gm/ litre used. Filter cloth of 100mesh, clean water were used.

**Spray Equipment:** The drying was carried out in an ACMEFIL make spray drier available with Gandhigram Trust, Gandhigram, Dindigul.



The main components of the drier were the feed system, air compressor with blower, rotary disk atomizer and peristaltic pump. The feed system of drying air constituted of a blower and

an air filter. The inlet and outlet air temperature was controlled and the product was collected by a cyclone.

### III. METHODOLOGY

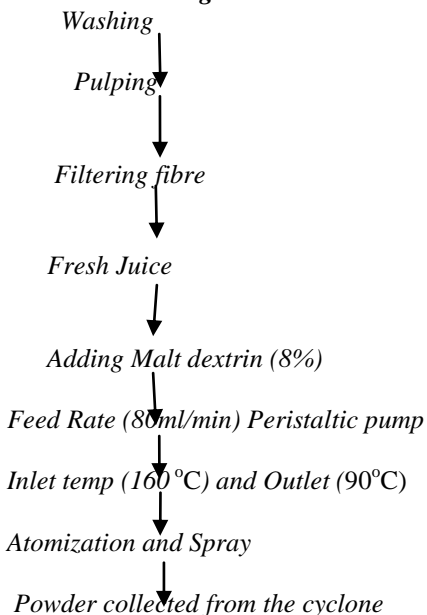
The process steps comprise:

- (a) Pre treatment of the fruit juice
- (b) Addition of water soluble drying aid – Malt dextrin.
- (c) Controlled flow of juice in to the atomizer.
- (d) Controlled inlet and outlet air temperature of the spray dryer.
- (e) Collection of powder from the cyclone and bottom outlet
- (f) Aluminium Foil Packing



- A. Fresh Tomato Juice extract from the pulper
- B. Spray drier (AcmeFIL make) – DST Gandhigram.
- C. Malt dextrin was added slowly and stirred well
- D. Tomato paste obtained with inlet temp 170°C

#### Process Flow Diagram



### IV. RESULTS AND DISCUSSIONS

The outlet air temperature was stabilized to 90°C and the inlet air temperature was maintained at required levels by adjusting the compressed air pressure till maximum recovery of tomato powder made. Batch size of 5 litres of tomato juice was used for all the trials.

#### Tomato powder recovery @different inlet temp.

Var	TSS	pH	Acidity	Inlet Temp °C	Outlet Temp °C	Feed flow rate (ml/min)
PK M1	6	4.1	0.4	160	90	80
Co-3	5.6	4.9	0.38	164	90	80
Ruchi	5.27	4.5	0.33	162	90	80

#### Yield:

10 litres of fresh juice yield 1kg of tomato powder.

#### Reconstitution:

Clean tangy tomato powder which can be reconstituted by addition of 5 parts of water obtained.

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