International Journal of Research in Engineering, Science and Management
Volume 4, Issue 5, May 2021
https://www.ijresm.com | ISSN (Online): 2581-5792

Introduction and Literature Reviews of Turmeric Polishing Machine

Ashwadeep Fulzele[1], Atharva Sagdeo[2*], Swati Kurhadkar[3]
[1,2,3]*Department of Mechanical Engineering, Tulsiramji Gaikwad Patil College of Engineering and Technology, Nagpur, India*

***Abstract*: The post processing of turmeric rhizome is done many days after the harvesting. In post processing maintaining the curcumin content in turmeric is important and which is depends upon the methods used for processing the turmeric. This process deals with machine which work efficiently to clean the turmeric rhizomes without boiling and steaming as the process of boiling and steaming lots of important chemical get lost which decrease the quality of the turmeric.**

***Keywords*: Hopper, Turmaric Rhizome, Belt conveyor, Water sprayer, Rotary brushes.**

1. Introduction and Literature Review

A. Introduction

Turmeric is an ancient spice derived from the rhizomes of Curcuma longa also known as 'Golden Spice of India' Turmeric has also been used for centuries in India in Ayurvedic medicine, which integrates the medicinal properties of herbs with food. Use of turmeric dates back nearly 4000 years to the Vedic culture in India. It is extensively used in Ayurveda, Unani and Siddha medicine as home remedy for various diseases. It is a perennial plant having short stem with large oblong leaves, and bears ovate, pyri form or oblong rhizomes, which are often branched and brownish-yellow in colour.

Modern interest on turmeric started in 1970's when researchers found that the herb may possess anti-inflammatory and antioxidant properties.

Safety evaluation studies indicate that both turmeric and curcumin are well tolerated at a very high dose without any toxic effects. India is a leading producer and exporter of turmeric in the world. Andhra Pradesh, Tamil Nadu, Orissa, Karnataka, West Bengal, Gujarat, Meghalaya, Maharashtra, Assam are some of the important states cultivating turmeric, of which, Andhra Pradesh alone occupies 38.0% of area and 58.5% of production.

During 2013-2014, the country produced 12.29 lakh tonnes of turmeric from an area of 2.34lakh ha. As we know India is largest producer of Turmeric but the condition of turmeric farmers is not good the sell their turmeric at low price in the market due to lack of processing equipment as it is too costly and not affordable by farmers. We have machines for this but Indians farmers cannot afford. This paper introduces a design and Fabrication of turmeric cleaner. Which is portable and mobile and also cheaper than other equipment available in the market. If the farmers use this machine, then his or her income will boost up due to processing.

B. Literature Reviews

1) Literature on processing of turmeric

Indu Rani Chandrasekaran et. al., they studied the effect on bioactive constituent due to the processing of turmeric rhizome. The improved post processing technique like boiling, drying, packaging and storage were compared with conventional operation and its impact is assessed on retention of biochemical constituent like essential oil, oleoresin and curcumin. Two varieties of turmeric PTS 10 and CO2 were studied over a four different boiling method viz. Cow dung slurry boiling, water boiling, pressure boiling and steaming. After drying and polishing the rhizome were stored by packaging in different material bag. Pressure boiling found to be most efficient method for maximum quality retention of turmeric. Study conclude that turmeric verity PTS 10 found to be best quality dry turmeric rhizome. The maximum retention of curcumin 5.21 %, oleoresin 14 %, essential oil 5.83 % was observed in pressure boiling which is followed by drying the rhizome in solar dryer for 35 hrs. processing. Radiation 60Co is used at a doses of 0,5,10,15 and

20 KGy on turmeric rhizomes. Folin -Ciocalteu process is performed to quantify the phenolic compound. The quantification of curcumin is performed by the HPLC (High Performance Liquid Chromatography). Sufficient great losses of phenolic compounds are observed in sample with 15 KGy and 20 KGy irradiated. Antioxidant activity index is assessed by the Rancimat method and which is observed significantly lower for doses of 5 KGy and 15 KGy irradiated. It is concluded that the gamma radiation from synthetic radioactive isotope of cobalt (60Co) is viable for the processing of turmeric. For the safety purpose of antioxidant activity doses up to 10 KGy is applied, as there are higher losses found in doses of 20 KGy and 15 KGy irradiated sample.

Vipul Damale et. al., they analysed the turmeric drying process experimentally. Traditional method of post processing of turmeric rhizome is studied and the effect of various parameter on production of turmeric is identified. Post

*Corresponding author: satharva14@gmail.com

processing of turmeric rhizome involves curing (boiling) of rhizome, drying of rhizome, polishing of rhizome, grinding of rhizome and packaging. Experiment performed over a sample of 5 grams. After boiling the turmeric rhizome in water the sample is dried in open sun. As the time passes the decreasing the weight of turmeric sample is obtained. They discussed about the combustion efficiency, fuels with various calorific value were used and its effect on mass flow rate of fuel for boiling, energy required for boiling. Optimum hours for open sun drying is identified so that minimum area of absorber is required. In conducted experiment 40 hrs is the optimum hrs for drying which require absorber area less than 0.0002 sq. M.

Dipsikha Kalita et. al., in this study curing of turmeric rhizome based on microwave is studied. It is observed that power and time shows great effect on curing when statistical analysis is done. However, power had low effect compare to time level. It is also observed that retention of curcumin is high in microwave cooking, due to microwave rhizome heats up quickly which reduces the processing time. Cooking of rhizome based on microwave requires 4 min for cooking which is very less time as compare to conventional cooking. Hence, cooking of rhizome based on microwave is used for best quality turmeric production potentially.

Jayashree Ettannil et. al., "Prathiba" is the variety of turmeric which is processed by the eight different ways. It is found that slicing is the most efficient method for the processing as the drying time reduces to 9 days, whereas in case of cooking the rhizome in water and steam drying time found to be 11 and 12 days respectively. The main content of turmeric is curcumin which is decreases with increase in curing time. The retention of curcumin in water boiling and in steam cooked rhizome is about 5.91% and 6 % respectively. They found the several advantages of steam curing over water boiling in terms of fuel required and quality of cured rhizome. Also the labour required for the processing is minimum.

J. Gitanjali et. al., in this investigation to retain the maximum curcumin content efficient combustion system for boiling of turmeric rhizome was developed Different feed stock viz. Coconut husk, tapioca stalk, wood chips, briquettes and juliflora were used to evaluate the performance of developed system for boiling of turmeric rhizome. 80 lit. Water is translated into steam from 100 lit water tank were tank capacity for holding the water is 100 lit. For the production of steam from water about 18 kg of fuel (biomass) feed stocks is consumed. For boiling of 100 kg turmeric sample the steam generated at 100oC and pressure of 8 kg/cm^2 is sufficient when curing time is 8 min. Curcumin content in developed system of combustion is retained up to 6.9 % which is quite higher than the uncooked rhizomes. Energy and mass closure efficiency of developed system found to be 91.62 and 91.27 respectively. It is found that the thermal output, power rating and energy efficiency of developed system is 24360 kcal/h, 28 kw and 18.26 % respectively.

Dr. Rahul C. Ranveer et. al., they investigated the effects of drying and curing method on constituent of turmeric such as curcumin, essential oil etc. Different cultivars of turmeric like Krishna, Tekurpeta and Salem was investigated in the study. Physio-chemical analysis of this three cultivars is done and it is found that Krishna cultivars was best from three cultivars. It is observed that Tekurpeta and Salem has higher value of colour. Rhizomes cured by improved method loose the moisture content faster as compare to rhizome cured by traditional method. Recovery of Salem cultivar rhizome is higher when it is cured by improved method followed by drying. It is found that the oil content of this three cultivarsis unaffected by drying and curing methods. Drying of rhizomes in shade-net was superior to that of cabinet drying and drying in the sun to retain the curcumin content.

K. J. Kamble et. al., they studied the improvements in the processing of turmeric. The study was conducted in College of Agricultural Engineering and Technology, Parbhani. Study was conducted over a different verity of turmeric rhizome by boiling in traditional and improved boiling pot. The traditional boiling pot is improved to reduce the fuel consumption, to improve the quality of rhizome and to reduce the time required for post processing. In traditional boiling pot the essential oil and curcumin content hold up to 2.93 % and 2.57 % respectively, whereas in case of improved pot the content found to be 3.33 % essential oil and 3.20 % is curcumin. It is also observed that 35 min boiling of turmeric in improved pot gave uniform colour than boiling of rhizome in traditional pot for 25 to 45 min.

M. Blasco et. al., there are two important steps in turmeric processing blanching and drying. In traditional processing of turmeric blanching is the general step and other option for solar drying is hot air drying. In this study various air flow rate 0.2, 0.5 0.7 1.2 m/s were taken to know the drying kinetics and its effect on the process. To investigate blanching effect, drying kinetics of blanched and unbalanced turmeric rhizome is carried out. During this temperature is different 60, 70, 80, 90 & 100 ^{o}C. Air velocity affect he mass transfer of turmeric during hot air drying. It is observed that in blanching removal of water tested at all temperature enhances but as the temperature increases its effect reduces.

Maria Lucia et. al., they studied the effect of post-harvest processes on turmeric production and its quality. Rhizomes was peel out, cooked in water, sliced, dried using paper towel and packed in bags of polyethylene and last at room temperature it stored 60 days. It is found that yield ranges from 9.83 to 14.50-gram powder per 100 gram of rhizome as their significant loss of moisture. Removal of peel results 30% loss of mass however, powder obtained is of high intensity red and yellow. It is observed that cooking of rhizome in alkaline media compared with regular cooking results high intensity of yellow and low pigment level. There is no significant change observed in curcumin content of rhizome when it is stored for 60 days.

2. Conclusions

The proposed polisher was capable of polishing 4 kg dried turmeric fingers in 10minutes. The polisher saved 81% and 87% polishing time over paddle-operated device beating and hand beating, respectively. The turmeric polisher saved 77.60% and 72.27% cost of polishing compared to hand beating and paddle-operated device beating, respectively. Considering custom hiring service as the same as hand beating (6.34 Tk/kg).

References

[1] Arora, M., Sehgal, V. K. and Sharma, S. R., 2007. Quality evaluation of mechanically washed and polished turmeric rhizomes. J. Ag. Eng., 44 (2):203–222.

[2] BBS. 2016. Year Book of Agricultural Statistics of Bangladesh. Bangladesh Bureau of Statistics, Ministry of Planning, Peoples Republic of Bangladesh, Dhaka.

[3] Camelo, A.F.L. and Gomez, P. A. 2004. Comparison of color indices for tomato ripening. Hort. Brassica, 22(2):534–537.

[4] Kalra, R., Jiangang, J., Druce, I. and Rauscher, M. 2013. Updates on geared vs. gearless drive solutions for grinding mills. Proceedings of SME Annual Meeting. Feb. 24–27, Denver, Colorado, USA, pp. 1–7.

[5] Krokida, M.K., Tsami, E. and Maroulis, Z.B., 1998. Kinetics on color changes during drying of some fruits and vegetables. Drying Technol., 16(3–5):667–685.

[6] Lozano, J.E. and Ibarz, A., 1997. Color changes in concentrated fruit pulp during heating at high temperatures. J. Food Eng., 31(3):365–373.

[7] Maskan, M., 2001. Kinetics of color change of kiwifruits during hot air and microwave drying. J. Food Eng., 48(2):169–175.