

*Dedicated to Ma and Deta*

*For their limitless love, selfless sacrifices, and unwavering support*

## **Declaration**

I do hereby declare that the thesis titled “**Experimental Performance Analysis of an improved Solar Dryer for Drying of *Garcinia pedunculata* and *Curcuma amada***” submitted to Tezpur University in part fulfillment of the requirements of the degree of Doctor of Philosophy in Mechanical Engineering under the School of Engineering is a result of my original research work on the subject. It has not been submitted in any form or part for any diploma or degree of any other institution, including this University.

**Date:**

**(Pooja Dutta)**

**Place:**

**Registration No.: TZ155381of 2015**

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**Date:** 26-05-2024

**Place:** Tezpur University

  
(Pooja Dutta)

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All help received by her from various sources has been duly acknowledged. No part of this thesis has been submitted elsewhere for the award of any other degree.

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## Nomenclature

		<i>Subscripts</i>
$\dot{E}$	Power (W)	
$\dot{H}$	Net heat transfer to system (W)	<i>i</i> inlet
$\dot{W}$	Net power by system (W)	<i>o</i> outlet
$T$	Temperature (°C)	<i>m</i> mass
$h$	Enthalpy (J/kg)	<i>l</i> loss
$V$	Velocity (m/s)	<i>ex</i> experimental
$Z$	Height from the datum (m)	<i>pr</i> predicted
$C_{pa}$	Specific heat of air (J/kgK)	<i>a</i> air
<i>Exp.</i>	Experiment	<i>t</i> at time 't'
$A$	Area (m <sup>2</sup> )	<i>in</i> input
$z$	Number of constants	<i>out</i> output
<i>EPPD</i>	Energy payback period (year)	<i>md</i> mixed-mode dryer
$Q_L$	Latent heat of vaporization of water (J/kg)	<i>sys</i> system
$m_w$	Amount of moisture evaporated (kg)	<i>SAC</i> solar air collector
$m_{i,p}$	Initial mass of the product (kg)	<i>avp</i> average predicted
$m_{j,p}$	Final mass of the product (kg)	<i>dry</i> dryer
$m_{t,p}$	Mass of the product at time 't' (kg)	<i>dc</i> drying chamber
$MC_p$	Moisture content at time 't' (%)	$\infty$ atmosphere
$M_{p,e}$	Moisture content at equilibrium (%)	
$M_{p,i}$	Moisture content at time 't = 0' (%)	
$MR$	Moisture ratio	
$\dot{E}x$	Exergy (W)	

$n$	Number of observations
$I$	Solar Radiation ( $\text{Wm}^{-2}$ )
$t_s$	total days a solar dryer (100 days assumed) per year
$t_d$	days is the drying time per batch

***Greek symbols***

$\alpha$	Absorptivity
$\tau$	Transmissivity
$\eta_{e,dry}$	Overall dryer efficiency ( %)
$\eta_{Ex,dc}$	Exergy efficiency of the dryer ( %)

