

Approved New Technical Programme

01. Experiment number and title (As per CJA)	:	Exp.# 1 13.5.3.69 Design and development of centrifugal dewatering machine for vegetable.
02. Budget Head		12935
03. Collaborative department, if any		Nil
04. Location and Agro-climatic sub region	:	Centre of Excellence on PHT , NAU, Navsari South Gujarat heavy rain fall zone (AES-III)
05. Investigators	:	PI: F. M. Sahu, Assistant Professor Co PI: 1. Dr. A. K. Senapati, Assistant Professor 2. Dr. P. S. Pandit, Assistant Professor 3. Dr. V. K. Sharma, Assistant Professor (FMP) from 2019
06. Year of commencement	:	2016-17
07. Season	:	Annual
08. Crop and variety	:	Different leafy vegetables and cut vegetables
09. Background and Justification		

An important factor for the stability of fresh-cut product is moisture control. After washing, the excess water should be removed from the fresh-cut product before packaging, to prevent rapid microbial development and enzymatic processes that lead to product quality deterioration. Various methods exist to remove washing water, including centrifugation, passing the produce over vibrating screens with air blasts, or blotting. Water remaining on the product is a critical issue. The most widely used method to dewater product in the fresh-cut industry is via centrifugation (spinning to force water to the outside of a perforated basket). There is a growing importance in the food industry about the use of low speed basket centrifuge to dewater or dry the surface water of washed fresh cut vegetables, especially salads greens, for later use in modified atmosphere packaging. The key factors while considering this system are duration and speed of centrifugation. Minimal centrifugation can leave residual water on the produce surface, thus favoring microbial growth, while excessive centrifugation can result in cellular damage and cause cellular leakage, greatly reducing quality. Fresh-cut products are often left with too much moisture, which causes rapid deterioration.

The centrifuge can be loaded manually with the aim to gently and effectively remove the water from the surface of the product after washing. Even for this machine, attention must be paid in the construction phase of simplicity, heavy duty and hygiene. The centrifugal system should offer the possibility to select the correct rotational speed for each product. In the model's operation, the cycle of centrifugation usually starts with modest load, especially in the case of delicate products such as certain types of salads. These then undergo increasing spinning speed (i.e., accentuated progressively) followed by decreasing spinning speed before the discharge of dewatered product. The basket must have the inner surface completely smooth without central axis or contact part that could directly damage the product. For hygiene reasons, contact part should be food grade plastic and SS304 along with branded drive with motor that could deliver at the same time an almost silent operation sequence cycle. The machine should be lighter construction, batch type and have reusable rotating perforated baskets, to facilitate rapid loading and unloading of the centrifuge. The reusable perforated baskets should usually be of light construction, often plastic to allow easy manual handling and economic replacement. Plastic has low tolerance for acceleration and deceleration forces but is well suited for undemanding application. In a view to develop a portable dewatering machine for vegetable, this study is taken with following objectives:

10	Objectives	:	<ol style="list-style-type: none"> 1. Design of a centrifugal dewatering machine suited for fresh and cut- vegetables. 2. Development and fabrication of the machine. 3. Evaluation of effect of speed and operation duration on dewatering of vegetable.
11.	Experimental details	:	

	(a) Treatments	:	<table border="1"> <thead> <tr> <th colspan="2" data-bbox="805 201 1442 233">Design Variables</th> </tr> <tr> <th data-bbox="805 233 1084 306">Dependent Variables</th> <th data-bbox="1084 233 1442 306">Independent Variables</th> </tr> </thead> <tbody> <tr> <td data-bbox="805 306 1084 380">Size and Shape of inner basket</td> <td data-bbox="1084 306 1442 380">Bulk density of crop</td> </tr> <tr> <td data-bbox="805 380 1084 453">Power requirement of machine</td> <td data-bbox="1084 380 1442 453">Moisture content of crop before and after washing</td> </tr> <tr> <td data-bbox="805 453 1084 569">Dimension and shape of outer bowl</td> <td data-bbox="1084 453 1442 569">Weight of crop before and after washing</td> </tr> <tr> <td data-bbox="805 569 1084 642">Structure of machine</td> <td data-bbox="1084 569 1442 642">Material of basket</td> </tr> <tr> <td data-bbox="805 642 1084 716"></td> <td data-bbox="1084 642 1442 716">Opening diameter (perforation) of basket</td> </tr> <tr> <td data-bbox="805 716 1084 831"></td> <td data-bbox="1084 716 1442 831">Weight and dimensions of kinematics component of machine</td> </tr> </tbody> </table> <p data-bbox="805 831 1442 894">Treatment details for performance evaluation and standardization:</p> <p data-bbox="902 894 1349 936">Spinning speed: 400, 500, 600 rpm</p> <p data-bbox="902 936 1333 978">Spinning duration: 2, 4, 6 minute</p>	Design Variables		Dependent Variables	Independent Variables	Size and Shape of inner basket	Bulk density of crop	Power requirement of machine	Moisture content of crop before and after washing	Dimension and shape of outer bowl	Weight of crop before and after washing	Structure of machine	Material of basket		Opening diameter (perforation) of basket		Weight and dimensions of kinematics component of machine
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	(b) Design	:	-																
	(c) Replications	:	Three																
			Comparison of the commercially available machine and its specifications with developed machine																
12	Conceptual Design																		

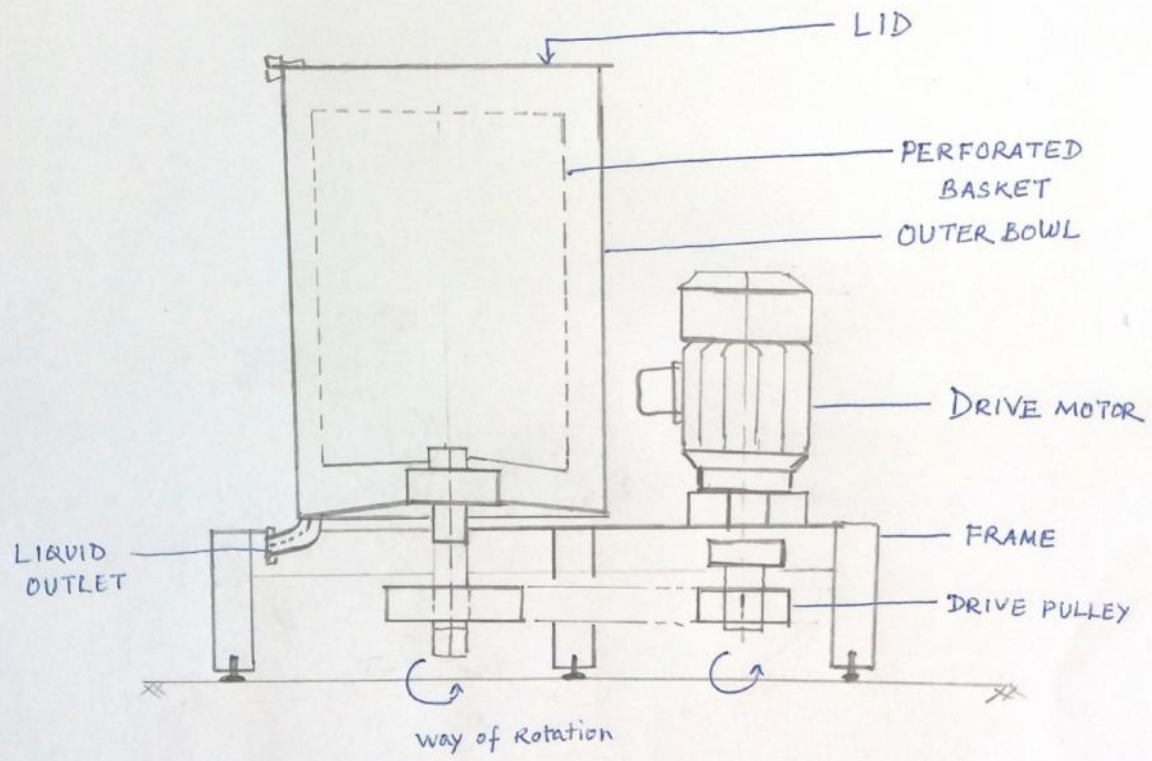


FIGURE: A CONCEPTUAL DIAGRAM OF CENTRIFUGAL VEGETABLE DEWATERING MACHINE