Annual Report
2018-19

Department of Processing and Food Engineering

College of Agricultural Engineering and Technology

Compiled by Arun K Attkan, Sunil Kumar, M.K. Garg

CCS Haryana Agricultural University, Hisar Haryana -125004

PREFACE

Globally, one-third of the produced food for human consumption is wasted or lost as per FAO study. Food waste is acknowledged as a global problem that needs to be solved on the way to achieve sustainable development of humankind. As per an independent post-harvest losses study in CIPHET, Ludhiana estimated 6.70-15.8% of fruits and 4.58-12.44% of vegetables were lost annually during various unit operations. Post-harvest losses of food are not restricted to developing countries like us only. Many of the other countries are still struggling to prevent losses by modernizing and upgrading their supply chains. The waste is started from the field and continues up to the consumption. Therefore, the techniques and employed methods for reducing waste and loss used in field, transportation, storage and processing. Adoption of post-harvest technology and growth of food processing industries are inter-related as post-harvest management increases the shelf life of fruits and vegetables and feed more to the agro processing industries. Agricultural productivity augmentation needs a concurrent development of post-harvest support mechanism including normal and cold storage facilities, packaging facilities, agro processing industries, crop sterilization and sanitation facilities and an effective marketing reach to global markets. Food processing adds value to the agricultural, horticultural, livestock and fisheries products by using various techniques like grading, sorting and packaging, etc. which enhances their shelf life. It leads to diversification of agricultural activities, improves value addition opportunities and creates surplus for export of agro food products. Due to heavy post-harvest losses, there exists a considerable gap between gross production and net availability to the consumers. The post-harvest losses start in the farm and travel along procurement chain and entire marketing channel.

As in the last year, department has made tremendous progress during this year. It has been possible due to active support from the Officers of the University and dedicated faculty and supporting staff of the department. I sincerely thank **Dr. K.P. Singh**, Vice-Chancellor; **Dr. R.K. Jhorar**, Dean, COAE&T; **Dr. S.K. Sehrawat**, Director of Research for their continuous support and encouragement.

I admire the efforts put up by **Dr. Arun Kumar Attkan** and **Er. Sunil Kumar** in compilation of this report. Constructive comments and feedback to improve the contents of annual report will be welcomed.

(M.K. Garg)

INDEX

Department of Processing & Food Engineering

Dr. M.K. Garg

Objectives

- Imparting education in the field of Processing & Food Engineering to both undergraduate students i.e. B.Tech. (Agril. Engg.)/B.Sc.(Hons.) Ag. and post graduate students i.e. M.Tech. (Agril. Engg.) with specialization in Processing & Food Engineering and Ph.D. in Processing & Food Engineering
- Advancement of learning and prosecution of research in the field of Processing & Food Engineering.
- Undertaking Extension activity for farmers in the field of Processing & Food Engineering

Emerging/Thrust Area

- Development of crop specific post-harvest techniques for reduction in quantitative & qualitative losses of farm produce.
- Development of machines for different post-harvest unit operations.
- Reduction in post-harvest losses.
- Income and employment generation through Agro-Processing Centers in rural areas.
- Hermetic Storage of Grains (Wheat).
- Testing and popularization of Agro-processing equipment's/ technologies suitable for Haryana state.

Faculty Members (as on 30.06.2019)

Dr. M K Garg,

Professor & Head

Ph.D.: ICAR-IARI, New Delhi

Specialization: Agricultural Processing & Structures

Dr. Ravi Gupta, (on Deputation) DHRM, CCSHAU Hisar

Professor

PhD: IIT, New Delhi

Specialization: Processing and Food Engineering

Dr. D K Sharma,

Associate Professor

Ph.D.: IIT, New Delhi

Specialization: Processing and Food Engineering

Dr. V K Singh,

Assistant Professor

Ph.D.: JNKVV, Madhya Pradesh

Specialization: Processing and Food Engineering

Er. Sunil Kumar,

Assistant Scientist

M.Tech.: CCS HAU, Hisar, Haryana

Specialization: Agricultural Processing & Structures

Dr. Arun Kumar,

Assistant Scientist

Ph.D.: Punjab Agricultural University, Punjab

Specialization: Processing and Food Engineering

Dr. Nitin Kumar,

Assistant Professor

Ph.D.: Punjab Agricultural University, Punjab

Specialization: Processing and Food Engineering

Dr. Anil Panghal,

Assistant Scientist

Ph.D.: GJUS&T, Hisar, Haryana

Specialization: Food Science and Technology

Schemes in operation (2018-19)

Sr. No.	Name of the Scheme	Scheme No.	Budget Allotted (Rs. Lakhs)	Expenditure (Rs. Lakhs)
1.	Teaching	T-8 Agri(B)-State		
2.	Testing & popularization of small scale agricultural processing equipments for their adoption in Haryana State	C(a) APE-I-Plan-Agri.	2.40	2.40
3.	AICRP on Post-Harvest Engineering &Technology (AICRP on PHET)	C(b) APE-1-ICAR	74.00	53.93

Scheme-wise Staff position (Teaching & Non-Teaching) (as on 30.06.2019)

Sr. No.	Name of the sanctioned post	Pay band + GP	Name of the employee working against the post	Date of joining CCSHAU	Date of retirement
Name of the Scheme: T-8 Agri (B)-State					
1	Professor	37400+10000 GP	Dr. M.K. Garg	06.11.1985	30.09.2020
2	Assoc. Prof.	15600+8000GP	Vacant	-	-
3	Asstt. Prof.	15600+7000GP	Dr. V.K. Singh	22.08.2009	30.06.2037
4	Asstt. Prof.	15600+6000GP	Dr. Nitin Kumar	04.07.2018-	31.12.2049
5	Asstt. Prof.	15600+6000GP	Vacant	-	-
6	Clerk	5200+1900GP	Vacant	-	-
7	Lab Asstt	5200+1900GP	Vacant	-	-
8	Messenger	4440+1300GP	Vacant	-	-
9	Tracer	5200+2000GP	Vacant	-	-
C(b)APE-1-ICAR					
1	Sr. Scientist	37400+9000GP	Dr. Ravi Gupta* (On deputation)	23.03.2018	
			Dr. Arun K Attkan**	30.07.2017	30.11.2048

			(Against the post of Sr. Scientist)		
2	Asstt. Scientist	15600+6000GP	Er. Sunil Kumar	16.08.2017	31.10.2050
3	Asstt. Sci.(FT)	15600+6000GP	Dr. Anil Panghal***	22.02.2019	30.04.2041
4	Mechanic	5200+2400GP	Sh. Mahadev	02.02.1996	29.02.2024
5	Lab. Asstt.	5200+1900GP	Sh. Ravi Kant	09.06.2003	28.02.2045
6	Clerk	5200+1900GP	Sh. Sarjit	01.04.1993	31.03.2030
7	Welder	5200+1800GP	Sh. Gopi Ram	01.04.1993	31.03.2028

*****Dr. Ravi Gupta transferred to DHRM on 19.06.2019
****** Dr. Arun K Attkan joined as Assistant Scientist in AICRP on 19.06.2019
***Dr. Anil Panghal joined as Assistant Scientist in AICRP on 22.02.2019

PG Students on roll (2018-19)

Sr. No.	Name	Admn. No.
1	Rinku Grover	2018AE07M
2	Praveen Saini	2018AE06M
3	Chander Mohan	2018AE04M
4	Peter Waboi Mwavrah	2018AE05M
5	Sachin	2018AE02D
6	Sushant	2017AE01D
7	Raveena	2017AE02D

M.Tech. Students who completed their degrees during 2018-19

Sr. No.	Name (Admn. No.)	Title of thesis	Name of the Advisor
1	Rihan Patel (2017AE01M)	Detection of insect infestation level in wheat by using sensors	Dr. M.K. Garg
2	Sapna (2017AE03M)	Engineering Interventions for energy efficient management of paddy Straw	Dr. Yadvika*
3	Ravi Kumar (2017AE04M)	Process development for microwave assisted extraction of glycyrrihizic acid from mulhatti	Dr. V.K. Singh
4	Charan Singh (2017AE06M)	Design and development of garlic stalk cutter (*Allium Sativum*) machine	Dr. V.K. Singh

*****PG faculty from Deptt. of Renewable and Bio Energy Engineering

Students' Achievements (JRF/NET/ARS)

- Anarase Dattatray Arjun qualified ARS-2019.

Courses taught (2018-19)

UG Courses

S.No.	Course No.	Course Title	Credit hours	Course Instructor
SEMESTER-I				
1	PFE 301	Dairy and Food Engineering	2+1	Dr. D. K. Sharma
2	PFE 304	Protected Cultivation & PHT (For B.Sc. (Hons.) Agriculture)	1+1	Dr. Arun Kumar Attkan
3	PFE 390	Summer Training-I	0+3	Dr. V. K. Singh
4	PFE 402	Design and Maintenance of Green House	2 + 1	Dr. Ravi Gupta
5	PFE 403	Food Packaging Technology (Elective-II)	2 + 1	Er. Sunil Kumar
6	PFE 401	Food Processing Plant Design and Layout	2+1	Dr. V. K. Singh
7	PFE 490	Summer Training-II	0+3	Dr. D. K. Sharma
8	PFE 411	Project-I	0+3	Dr. M.K. Garg, Dr. D.K. Sharma, Dr. V.K. Singh, Er. Sunil Kumar, Dr. Arun Kumar Attkan and Dr. Nitin Kumar
SEMESTER-II				
1.	PFE 201	Engineering Properties of Agricultural Produce	2+1	Dr. Arun Kumar Attkan
2	PFE 302	Agricultural Structures & Environmental Control	2+1	Dr. Nitin Kumar and Dr. M.K. Garg
3	PFE 303	Drying and Storage Engineering	2+1	Er. Sunil Kumar and Dr. Arun K Attkan
4	PFE 410	Hands on Training in Processing of Agricultural Produce	0+3	Dr. V.K. Singh and Dr. Ravi Gupta
5	PFE 412	Project on Processing and Food Engineering – 1I	0+3	Dr. M.K. Garg, Dr. D.K. Sharma, Dr. V.K. Singh, Er. Sunil Kumar, Dr. Arun Kumar Attkan and Dr. Nitin Kumar
6	PFE 391	Under-graduate seminar	0+1	Dr. Nitin Kumar
7	PFE 305	Renewable Energy (for Agric. Students)	1+0	Offered by RBEE

PG Courses

S.No.	Course No.	Course Title	Credit hours	Course Instructor
		SEMESTER-I		
1	PFE 503	Advanced Food Process Engineering	2+1	Dr. Nitin Kumar
2	PFE 505	Energy Management in Food Processing Industries	2+1	Dr. Yadvika
3	PFE510/ FST 505	Food Packaging	2+1	Er. Sunil Kumar and Dr. M.K. Garg
4	PFE 595	Industry Institute Training	0+1	Dr. Ravi Gupta
5	PFE 599	Master's Research	-	All Concerned teachers
6	PFE 602	Advances in Food Processing	2+1	Dr. Nitin Kumar
7	PFE 603	Mathematical Models in Food Processing	3+0	Dr. M.K. Garg and Er. Sunil Kumar
8	PFE 604	Advances in Drying of Food Materials	2+1	Dr. V. K. Singh
9	PFE 609	Special Problem in Processing and Food Engg.	0+1	Dr. M.K. Garg
10	PFE 691	Doctoral Seminar	1+0	Dr. D.K. Sharma
11	PFE 699	Doctoral Research	-	All Concerned teachers
		SEMESTER-II		
1	PFE 501	Transport Phenomena in Food Processing	2+1	Dr. Nitin Kumar
2	PFE 502	Engineering Properties of Biological Materials		Dr. V.K. Singh
3	PFE 504	Farm Structures & Environmental Control	2+1	Dr. M.K. Garg
4	FST 503	Food Engineering	2+1	Er. Sunil Kumar and Dr. Arun Kumar Attkan
5	PFE 601	Textural & Rheological Characteristics of Food Materials	2+1	Dr. Nitin Kumar
6	PFE 513	Storage Engineering & Handling of Agricultural Products	2+1	Er. Sunil Kumar
7	PFE 605	Agricultural Waste and By Product Utilization	2+1	Dr. M.K. Garg
8	PFE 591	Master's Seminar	0+1	Dr. Arun Kumar Attkan
9	PFE 599	Master's Research	-	All Concerned teachers
10	PFE 699	Doctoral Research	-	All Concerned teachers
11	PFE 692	Doctoral Seminar-II	1+0	Dr. V.K. Singh

New Projects Submitted

S. No.	Title of project	Principal Investigator (s)	Funding Agency	Amount (in lakh)	Status
1	Development of RTE value added extruded product with underutilized chickpea husk	Er. Sunil Kumar	MHRD-SPARC	74.50	Under process
2	Centre of excellence for fruits and vegetable processing	Dr. Anil Panghal	MIDH	1000	Under process
3	Establishment of controlled atmosphere storage facility for fruits and vegetables	Er. Sunil Kumar	MIDH	500	Under process
4	Establishment of Custom Hiring Center for Farm Machinery and Post-Harvest Services with Mobile App Interface at CCS HAU, Hisar	Er. Bharat Patel	RKVY RAFTAR	273	Under process
5	Establishment of Pilot Scale Turmeric Processing Unit for promoting SC Farmers/ Small Entrepreneurs	Dr. VK Singh	RKVY RAFTAR	118.50	Under process
6	Establishment of Secondary Processing Facility for Promoting Entrepreneurship and Skill Development amongst SC Farmers	Er. Sunil Kumar	RKVY RAFTAR	230	Under process
7	Processing of cereals, millets and pulses for value addition	Dr. RK Jhorar	ICAR ELP	126	Under process

Research achievements during 2018-19

1. **Testing and popularization of small scale agricultural processing equipments for their adoption in Haryana State**

- The capacity of machine was found to be 45 kg/h. modification was carried by increasing the height of machine, which can change the ergonomics parameter. After modification, the capacity of machine was found to be 50 kg/h and also muscle comfort is more in modified machine. So this modified machine is ergonomically suitable and it can be used by the farmer and small entrepreneurs.
- The power operated hammer mill was tested for its performance. The machine capacity and turmeric powder recovery were found 37.4 kg/h and 98.9% respectively 9% moisture content. This machine is suitable for farmer as well as small entrepreneurs.

2. **Ergonomical study of Hand operated maize sheller**

Machine Design

- The hand operated maize sheller made of mild steel sheet, iron bar with stainless steel shelling unit like cylinder shape. The diameter of shelling unit is 26 cm and it has die in the middle of cylinder having the diameter of 3.5 cm. The upper diameter of die is less than the lower diameter of die. Two dies are made for machine, one is for small size cobs and other is for bigger size cobs. During operation the dried maize cobs was fitted on die and it was pressed by stainless steel plunger like piston type mechanism. Moisture content

of maize grain was 9 % (wb) and after shelling operation, the grains were collected at one side of the cylinder and the remaining part was pushed down beneath the machine.

Ergonomical study

- The study was carried out on a sample of two healthy male with age ranging from 20-25 years. The maize sheller machine was operated by a subject at three different working speed *viz.* low, medium and high (number of maize cob shelled per 5 min) at two different heights. Each subject operated the machine for 30 min. including a rest of 5 minutes which was given to him after every 5 min. So the overall working time for one subject was only for 15 min. Different equipment were used to study the ergonomics and performance of the machine was thus evaluated. The experiments consisted of shelling the maize grains from the cobs by employing hand operated maize sheller. The physiological work load and biochemical stress were calculated from the above observations.

Hand operated maize sheller

Working method

- The quantity of maize taken for the purpose of shelling was 50 Kg. Two different healthy people falling in the moving group of 20 to 25 years were chosen to conduct the shelling of the maize by using the hand operated maize sheller. The ambient conditions were recorded by using different equipments and were kept same in order to study the ergonomics and to evaluate the performance. The ambient conditions data follows:
- Ambient Temperature = 33°C
- Relative Humidity = 47%
- Barometric pressure (mm/hg) =737

Table 1 Anthropometric data of various subjects

S. No.	Anthropometric measurements	Subject 1	Subject 2
1	Age (years)	21	23
2	Weight (kg)	51	65
3	Sex	Male	Male
4	Vertical reach height(cm)	219	230
5	Elbow height(cm)	99	112

6	Knee height(cm)	53	58
7	Shoulder height(cm)	146	151
8	Total arm length(cm)	63.5	79.5
9	Hand width(cm)	9.5	10
10	Elbow span(cm)	83	87
11	Height(cm)	168	175

The subjects carried out the experiments for 15 min each at different height adjustment and varying speed of operation. The size of the maize cob taken for sheller was as follows:

1. Average length = 12.05 cm
2. Average width = 9.22 cm
3. Average thickness = 4.61cm

The various parameters that were recorded for different subjects in order to study the ergonomic assessment of maize sheller were as follows:

Measurement of heart rate

The resting, working and average heart rates, time of activity and PO_2 levels of different subjects were as follows:

Hand operated maize sheller machine (modified height)

Table 2 Heart rates of all subjects during pricking with shelling

Time (min.)	Subject 1		Subject 2	
	W.H.R	R.H.R	W.H.R	R.H.R
1	79	98	88	96
2	84	96	91	97
3	89	90	93	90
4	86	92	94	98
5	83	85	95	80
6	89	81	96	87
7	90	79	96	89
8	94	79	98	90
9	90		95	
10	95		102	
11	94		99	
12	95		102	
13	101		100	
14	98		99	
15	101		101	

W.H.R = Working heart rate (BPM) and R.H.R = Recovery heart rate (BPM), BPM= Beats per minute

Table 3 Different parameters of all subjects during shelling

S. No.	Parameters	Subject 1	Subject 2
1	Avg. working heart rate (beats per minute)	90	94
2.	Resting heart rate (beats per minute)	81	84
3.	PO_2 in blood before activity	98	98
4.	PO_2 in blood after activity	98	99
5.	Time taken activity (min)	14.4	15.0

Hand operated maize sheller machine (normal height)

Table 4 Heart rates of all male during shelling

Time (min.)	Subject 1		Subject 2	
	W.H.R	R.H.R	W.H.R	R.H.R
1	79	96	88	98
2	81	93	90	96
3	85	94	91	95
4	86	89	94	92
5	84	86	96	89
6	89	84	96	88
7	92	80	99	87
8	91	80	100	87
9	94		99	
10	95		103	
11	96		97	
12	94		98	
13	95		100	
14	98		99	
15	99		98	

W.H.R = Working heart rate (BPM), R.H.R = Recovery heart rate (BPM), BPM= Beats per minute

Table 5 Different parameters of all subjects during shelling

S. No.	Parameters	Subject 1	Subject 2
1.	Avg. working heart rate (beats per minute)	93	95
2.	Resting heart rate (beats per minute)	78	82
3.	PO_2 in blood before activity	98	98
4.	PO_2 in blood after activity	98	99
5.	Time taken activity (min)	15.00	14.32

Measurement of energy expenditure

From the values of HR, energy expenditure was calculated. The energy expenditure, calculated by regression equation during the shelling activity in all adjustment of height was as follows:

Table 6 Energy expenditures of different subjects using different height for shelling

Subjects	Modified height (cm)	Normal height (cm)
Subject 1	5.780	8.695
Subject 2	6.639	6.784

Measurement of physiological workload

Physiological cost involved in this operation was expressed in terms of cardio-respiratory responses of the subjects during work and the main parameters measured were heart rate and oxygen consumption rate. Heart rate (HR) was an indicator of cardiac stress due to physical workload. From the values of HR, total cardiac cost of work (TCCW) and physiological cost of work (PCW) were calculated as following:

Table 7 Cardiac cost of work for different subjects using different methods for shelling

Subjects	Cardiac cost of work (beats)	
	Modified height (cm)	Modified height (cm)
Subject 1	129.6	195
Subject 2	150	186.6

Table 8 Cardiac cost of recovery for different subjects using different methods for shelling

Subjects	Cardiac cost of recovery (beats)	
	Modified height (cm)	Normal height (cm)
Subject 1	15	25
Subject 2	30	50

Table 9 Total cardiac cost of work for different subjects using different methods for shelling

Subjects	Total cardiac cost of work (CCW + CCR)	
	Modified height (cm)	Normal height (cm)
Subject	144.6	220
Subject	180	236.6

Now from TCCW, physiological cost of work was calculated by dividing TCCW with the average time of the activity i.e. shelling of maize.

Table 10 Physiological cost of work for different subjects using different adjustment

Subjects	Physiological cost of work (b.p.m)	
	Modified height (cm)	Normal height (cm)
Subject 1	11.14	16
Subject 2	14.26	15.42

Measurement of grip fatigue and load

Grip dynamometer was used to measure grip strength at rest, and after the work separately for the right and left hand. Grip fatigue for all the 3 methods were as follows:

Table 11 Grip fatigue for different subjects working by different methods

Subjects	Grip fatigue (%)	
	Shelling of maize	
	Left hand	Right hand
Subject 1	1.74	4.15
Subject 2	1.65	3.90

Grip fatigue of the subjects in all the methods of shelling was more in the right hand as compared to the left hand because of the fact that the subjects were not ambidextrous but they were right handed.

Design Invention

To change of machine ergonomic study we make four legs stand. It can help for increasing the capacity of maize Sheller.

Dimension of stand:

Height = 15cm

Length of Pipe = 12cm

Distance between two leg =30 cm

Modified Hand operated maize sheller

Basic anthropometric data of the subjects have been presented in above table. As shown in the shelling through ergonomic point of view, respondents in the age group of 20 to 25 years were selected. The basic body dimensions were measured, an average was worked out as height (171.2 cm) and weight (55.3 kg), respectively. As compared to traditional method such as Hexagonal tubular maize sheller, hand maize sheller is best option for the men and women, it saves not only the time but increases the efficiency of farm worker twice. The physiological difference was also observed by many research workers during various agricultural operations. The energy expenditure in case of hand operated maize sheller was found to be almost equal in both heights. The capacity of hand operated maize sheller machine was found to be 50 kg/hour. Physiological stress of the maize sheller was determined on the basis of various parameters like average heart rate during work and rest, energy expenditure and physiological cost of work while performing the activity.

Conclusion

The capacity of machine was found to be 45 kg/h. modification was carried by increasing the height of machine, which can change the ergonomics parameter. After modification, the capacity of machine was found to be 50 kg/h and also muscle comfort is more in modified machine. So this modified machine is ergonomically suitable and it can be used by the farmer and small entrepreneurs.

3. Performance evaluation of Hammer mill

Hammer mill

Hammer mill machine consists of 2 HP electric motor, feed hopper, hammer assembly, grinding chamber, screen, outlet, and pulley and drive mechanism. Grinding chamber has a provision for dry spices inlet or feed hopper and a rotor. Grinding Chamber lined a set of swinging blades or hammers on a balanced rotor. The grinding chamber was housed with a control screen for controlling the degree of fineness of grinding. Both brittle and fibrous materials could be handled in hammer mills, though with fibrous material, projecting sections on the casing may be used to give a cutting action. The material is broken by rotating hammers and collected by cyclonic mechanism.

S. No.	Particulars	Dimensions/ units
1	Over all dimensions	140 x 80 x 240 cm
2	Weight	150 kg
3	Power	Electric motor (2 hp)
4	Manpower	1 person

Machine capacity

Total input weight of dried turmeric (kg) = 37.4

Total time taken for the operation (h) = 1

$$Machine\ capacity\ (kg/h) = \frac{Weight\ of\ turmeric\ (kg)}{Total\ time\ taken(h)}$$

$$= \frac{37.4}{1}$$

$$= 37.4\ kg/h$$

Turmeric powder recovery

$$\text{Recovery}\,(\%) = \frac{\textit{Weight of grounded turmeric}\,(kg)}{\textit{Total weight of whole dried turmetic}\,(kg)} \times 100$$

$$= \frac{37.4}{37.8} \times 100$$

$$= 98.9\%$$

Power Operated Hammer mill

Conclusion

The power operated hammer mill was tested for its performance. The machine capacity and turmeric powder recovery were found 37.4 kg/h and 98.9% respectively 9% moisture content. This machine is suitable for farmer as well as small entrepreneurs.

4. Development and performance evaluation of power operated Aloe-vera leaf filleting cum gel extraction machine

Aloe Vera gel extractor

Aloe Vera processing methods for gel expulsion includes roller method, splitting of leaf, crushing of whole leaf, centrifugal separation and hand filleting methods were described in various references. The manual filleting of Aloe Vera leaf is a time consuming process.

The Aloe Vera leaf was fed to the machine after removing the jagged edges manually. The machine works on the principle of compression. It consists of 3 pairs of rollers to which Aloe Vera leaf is fed and the roller expresses the gel. The gel comes out and is collected at a chamber below the roller assembly.

Power requirements

The relationship between the power requirements for the Aloe Vera gel extraction machine with load and without load was determined. The power consumed with and without load was 0.223 kW and 0.15 kW respectively. Useful power was found to be 0.073 kW.

Aloe Vera Filleting cum Gel Extractor

Gel extraction procedure

After fabrication of machine, the initial trials were done in order to select the different parameters i.e. RPM of roller shaft and thickness of Aloe Vera leaf. There was need to optimize these parameters. So an experimental procedure was adopted. Whole the experimental procedure was summarized as follows:

- For conducting experiment, the machine parameters i.e. RPM of roller shaft and thickness of leaf were taken as variable parameters whereas the crop parameters such as variety of crop and their moisture content was kept constant.
- The fresh Aloe Vera leaves were produces from the Department of Plant Genetics in CCS HAU, Hisar and brought to laboratory in a covered polyethylene bag to avoid oxidation or contamination.
- It was observed that a set of 12 leaves was good for conducting the different experiments. 3 leaves each for 3 different thickness range.
- 6 levels roller speeds (60, 75, 90, 105, 120 and 135 rpm) and three levels of leaf thickness (<15 mm, 15-20 mm and > 20 mm) were taken for crude gel recovery, residual gel percentage and gel expulsion efficiency.
- Then the different experiments were conducted by using Aloe Vera and readings of dimensions of leaf, weight of leaf, actual gel recovery and theoretical gel recovery were taken.
- These readings were analyzed for performance evaluation of the machine.

Performance evaluation

The Aloe Vera gel extraction machine was evaluated to quantify the degree of influence of various independent parameters on the quantity of extracted gel. Two parameters i.e. rollers speed and thickness of leaves were defined based upon the literature review and preliminary conducted studies. The gel recovery was evaluated in terms of dependent parameters viz. crude gel recovery (%), residual gel percentage (%) and expulsion efficiency (%). Experiments were conducted by changing various machine and leaf parameters.

Analysis of crude gel recovery

Crude gel recovery is defined as the ratio of weight of extracted gel to the weight of leaf. During the analysis, it was observed that both roller speed and leaf thickness have significant effect on crude gel recovery. The statistical analysis showed that the effect of roller speed and thickness was significant at 5% level of confidence. The crude gel recovery was maximum at 59.7% was found at greater than 20 mm leaf thickness. The minimum gel recovery 40.63% was found at 15 mm leaf thickness. However, further increase in speed decreases the gel recovery. The decrease in gel recovery might be due to the fixed lower blades and orientation of leaf may be affected at higher speeds. It was also observed that the mean value of the maximum gel recovery i.e. 55.21% was found for leaf thickness greater than 20 mm whereas the mean value of minimum gel recovery.

Analysis of residual gel percentage

The residual gel percentage was defined as the ratio between difference of theoretical and actual gel recovery to the theoretical gel recovery. The statistical analysis showed that the effect of roller speed and thickness was significant at 5% level of confidence. The minimum residual gel percentage i.e. 5.19% was found at greater than 20 mm thickness whereas the maximum residual gel percentage i.e. 22.54% was found with leaf less than 15 mm thickness. From the results, it was clear that as the leaf thickness decreases the residual gel percentage increases whereas increase in leaf thickness decreases the residual gel percentage. This might be due to the adjustable upper scrapping blades which adjusts itself according to the leaf thickness

Extracted Aloe Vera Juice by Aloe Vera Filleting and Juice Extractor

The machine was quite simple and is capable of extracting large amount of gel from Aloe Vera leaf in small time. The machine was provided with auto expanding mouth piece to process Aloe Vera leaf of varying sizes without difficulty. A provision of auto adjustable angle iron assembly was made to suit different thickness of Aloe Vera leaf. Performance evaluation of Aloe Vera gel extraction machine was done to optimize various parameters such as RPM of roller shaft and leaf thickness. The crude gel recovery was maximum at 59.7% was found at leaf greater than 20 mm leaf thickness. The minimum gel recovery 40.63% was found at leaf having less than 15 mm leaf thickness. The highest gel expulsion efficiency i.e. 94.8% was obtained with leaf having thickness greater than 20 mm whereas the lowest gel expulsion efficiency was found with leaf having thickness less than 15 mm. The mean value of maximum gel recovery, minimum residual gel percentage and maximum expulsion efficiency was found for leaf thickness greater than 20 mm. The capacity of machine was approximately 200 kg/hr. The machine was fabricated by using low cost material available in local market. The machine will surely help farmers by adding the value to agricultural products. In this way, a farmer will get better returns for their investment.

5. Preparation and utilization of nano formulations to impart rat repellent property to poly woven bags

The experiments were conducted to extract the oil from eucalyptus oil by hydro-distillation. The moisture content of leaves was calculated by standard air oven method and the results are as follows:

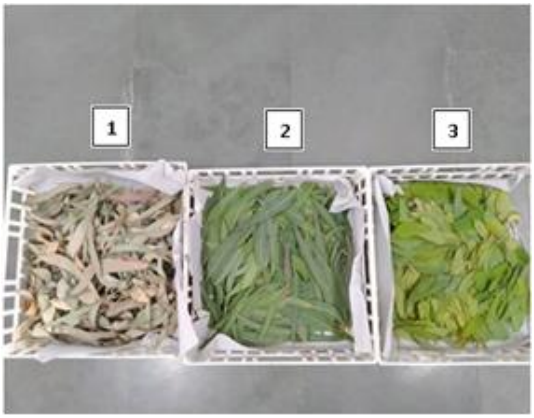
$$\text{Moisture Content } (\%, \text{wb}) = \frac{\text{Wet Weight} - \text{Dry Weight}}{\text{Wet Weight}} \text{ x } 100$$

The moisture content of fresh leaves was 22.16±1.1%; for mature leaves it was 16.61±0.8% and for dried leaves it was 6.02±0.1%

The extraction yield of eucalyptus oil at varying extraction time was calculated and expressed in percentage. The colour of oil was perceived as pale yellow. Colour estimation was done by colorimeter. The values of L, a and b were recorded with the help of colorimeter. Specific gravity of oil was assessed by hydro meter. Value of specific gravity was almost same in all types of leaves (fresh leaves, mature leaves and dry leaves). These parameters are provided in the table below:

Maturity	Moisture Content	Time (Hrs)	Sp. Gravity	Yield (%)	Colour		
					L	a	b
Fresh	22.16±1.1	2	0.9140	0.50	35 ± 0.17	0.20 ± 0.07	6.30 ± 1.32
		4	0.9110	0.80	34 ± 0.15	0.22 ± 0.17	6.58 ± 0.48
		6	0.9115	1.20	35 ± 0.40	0.21 ± 0.07	6.12 ± 0.62
		8	0.9200	1.50	35 ± 0.80	0.23 ± 1.71	6.33 ± 0.32
Mature	16.61±0.8	2	0.9020	0.45	39 ± 0.30	0.29 ± 1.09	7.23 ± 1.48
		4	0.9230	0.60	38 ± 0.16	0.30 ± 0.24	7.58 ± 0.98
		6	0.8950	0.90	38 ± 0.21	0.32 ± 0.32	7.11 ± 1.48
		8	0.8990	1.00	39 ± 0.32	0.41 ± 0.40	7.68 ± 0.52
Dry	6.02±0.1	2	0.8910	0.10	38 ± 0.20	0.37 ± 0.11	8.66 ± 0.59
		4	0.8890	0.10	39 ± 0.15	0.42 ± 0.12	8.11 ± 1.22

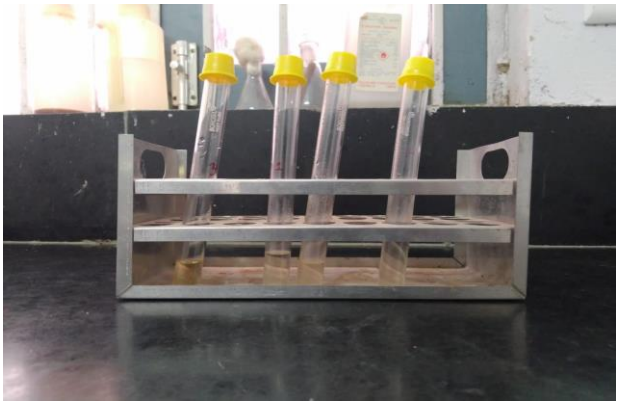
		6	0.9140	0.20	39 ± 0.10	0.41 ± 0.16	8.22 ± 0.18
		8	0.9200	0.20	39 ± 0.19	0.40 ± 0.20	8.36 ± 0.20



Classification of eucalyptus leaves

Hydro-distillation unit

Rotary evaporator



Extracted eucalyptus oil

6. Agro Processing Activities

- Supply of Soy Tofu in the hostels made by students under the ELP unit.
- Agro-processing center facilities were utilized for the production of turmeric powder, garlic powder, extruded products and its selling.
- Demonstration of processing machines to the farmers in laboratories and *Kisan Mela*.
- Water reuse attachment of HAU type carrot washer is a time and fuel consuming accessory (Require 63% more time and 53% reduction in capacity).
- Continuous double stage carrot washer can be developed to reuse waste water and subsequent cleaning by clean water without compromising the machine capacity and quality of cleaned carrots.

Students Project work (UG) – 2018-19 (Updated on 30.06.2019)

Sr. No.	Name of the student (Admission No.)	Title of the Project Report	Advisor (Dr.)
1.	Ankush (2015AE04BIV)	Ergonomic evaluation of hand operated maize sheller	Dr. V. K. Singh
2.	Chander Jakhar (2015AE07BIV)	Measurement of frictional properties of selected grains	Dr. V. K. Singh
3.	Chirag Mehta (2015AE08BIV)	Development of water reuse attachment for carrot washer	Er. Sunil Kumar
4.	Kartikeya (2015AE10BIV)	Study on seed processing plant	Dr. D. K. Sharma
5.	Manav (2015AE12BIV)	Extraction of eucalyptus oil from leaves by hydro distillation	Dr. Nitin Kumar
6.	Naresh (2015AE17BIV)	Development of lab sacle solar assisted thermoelectric cooling chamber for fruits and vegetables	Dr. A. K. Attkan
7.	Nitin Kumar (2015AE19BIV)	Extraction of Eucalyptus oil from microwave distillation	Dr. Nitin Kumar
8.	Pawan (2015AE21BIV)	Performance evaluation of Kinnow cleaner cum grader	Dr. Ravi Gupta
9.	Sahil Kumar (2015AE26BIV)	Development of filleting cum aloe vera gel extraction machine	Dr. A. K. Attkan
10.	Sunil Kumar (2015AE29BIV)	Compliance status of BIS standards for metal bin in Hisar region	Er. Sunil Kumar
11.	Vishal (2015AE35BIV)	Bael giri (*Argle marmelos*) pulp extractor tool and cutting machine	Dr. M. K. Garg

Publications (2018-19)

Research Papers

- Panghal, A., Kaur, R., Janghu, S., Sharma, P., Sharma, P., & Chhikara, N. (2019). Nutritional, phytochemical, functional and sensorial attributes of Syzygiumcumini L. pulp incorporated pasta. *Food Chemistry*, 723-728. **(NAAS Ratting: 10.95)**
- Devgan, K., Kaur, P., Kumar, N., & Kaur, A. (2019). Active modified atmosphere packaging of yellow bell pepper for retention of physico-chemical quality attributes. *Journal of food science and technology*, 56(2), 878-888.) **(NAAS Ratting: 7.80)**
- Raleng, A., Singh, A., Chavan, P., Attkan, A., & Singh, B. (2019). Standardization of deep frying process and their effects on storage stability of pineapple pomace powder incorporated rice based extruded product. *Journal of Food Processing and Preservation*, e13950. **(NAAS- 7.51)**
- Sofi, S.A., Singh, J., Chhikara, N. & Panghal A. (2019) Effect of incorporation of germinated flour and protein isolate from chickpea on different quality characteristics of rice based noodle. *Cereal Chemistry*, DOI: 10.1002/cche.10192 (**NAAS Rating: 7.14**)
- Kumar, S., Mohapatra, D., Kotwaliwale, N., & Singh, K. K. (2018). Performance evaluation of PVC coated fabric bag for on farm storage of wheat. *Indian Journal of Agricultural Sciences* **(NAAS Rating 6.23)**. (Accepted 08/05/2018)
- Attkan, A. K**.**, and Yadav, Y. K. (2018) Sorption Study on Developed Low-cost Solid Desiccant Material for Solar Dryer. *Journal of Agricultural Engineering*, 55(3), 52-58. **(NAAS-5.59)**
- Alam, M. S., Kumar, N., & Singh, B. (2018). Development of Sweet Lime (*Citrus LimettaRisso*) Pomace Integrated Rice based Extruded Product: Process Optimization. *Journal of Agricultural Engineering*, 55(1), 47-53. **(NAAS- 5.59)**
- Balwan Singh, Vijay K. Singh and Sunder Singh (2019) Comparative Study of Different Drying Methods for Drying of Blanched Fenugreek Leaves. *Int. J. Current Microbiology and Applied Sci.*, *8*(1): 1070-1076. **(NAAS Ratting: 5.38)**
- Victor, S.L., Garg, M.K. and Pawar, Kanika (2019). Effect of different drying techniques on the quality attributes of pineapple powder. *Int. J. Curr. Microbial. App. Sci.* 8(2): 324-341. DOI: https:/doi.org/10.20546/ijcams.2019.802.038. **(NAAS Ratting: 5.38)**
- Raveena Kargwal, Yadvika, V. K. Singh, M. K. Garg, Vinod, Mohit Kumar and Monika Mathur (2019). Energy Consumption Pattern of Value Added Products of Pearl Millet. *Current Journal of Applied Science and Technology* (British Journal of Applied Science and Technology). 35(1): 1-5. DOI: 10.9734/CJAST/2019/v35i130160. **(NAAS Ratting: 5.32)**
- Kaur, S., Panghal, A., Garg, M.K., Mann, S., Khatkar, S.K., Sharma, P., & Chhikara, N. (2019). Functional and Nutraceutical Properties of Pumpkin- A Review. *Nutrition and Food Science*, DOI 10.1108/NFS-05-2019-0143) **(NAAS Ratting: 5.26)**
- Sushant Bhardwaj, Yadvika, Ravi Prakash, Satykaam Malik, V.K. Singh (2018) Energy auditing in a dairy farm, school and temple complex in Hisar district, Haryana, India. *Indian Journal of Health and Well being*. *Vol. 9(6*), 962-967. **(NAAS Ratting: 4.13)**

Book Chapters

- Sharma P. Panghal, A., Gaikwad, V., Jadhav, S., Bagal, A., Jadhav, A., Chhikara N. (2019). Nanotechnology: A Boon for Food Safety and Food Defense. In: Prasad R., Kumar V., Kumar M., Choudhary D. (eds) Nanobiotechnology in Bioformulations. Nanotechnology in the Life Sciences. Springer, Cham (Book Chapter) https://doi.org/10.1007/978-3-030-17061-5_9
- Panghal A., et al. (2019) Microencapsulation for Delivery of Probiotic Bacteria. In: Prasad R., Kumar V., Kumar M., Choudhary D. (eds) Nanobiotechnology in Bioformulations. Nanotechnology in the Life Sciences. Springer, Cham https://doi.org/10.1007/978-3-030-17061-5_6
- Panghal A. et al. (2019) Nanoemulsions: A Promising Tool for Dairy Sector. In: Prasad R., Kumar V., Kumar M., Choudhary D. (eds) Nanobiotechnology in Bioformulations. Nanotechnology in the Life Sciences. Springer, Cham https://doi.org/10.1007/978-3-030-17061-5_4

Popular Articles

- Sunil Kumar, Pavel Somavat and MK Garg (2018). "Vayu-rodhi bag – anaj bhandarn ke liye ek Javikaurprabhbi technique" for Hindi magazine "Jighasa" of Hindi Cell, IIT Delhi.
- Yadvika, Kargwal, Raveena and Garg, M.K. (2018). Kachua avm vermin-compost prethakkaran sayantar, 51(7):20-21.
- Kargwal, Raveena, Garg, M.K. and Yadvika (2018). Phal avm sabji chetai (grading) sayantar. Haryana Kheti, 51(11):10.
- Kargwal, Raveena, Yadvika and Garg, M.K. (2019). Portable vermin-compost kit. Haryana Kheti, 52(3):23.

Abstracts Published

- Banga, K. S., Kumar, P., Kumar, S. and Nickhil C (2019). Effect of Extrusion Process parameters on Quality Evaluation of Sesame Seed Cake Extrudates. International Symposium on "Engineering Technologies for Precision and Climate Smart Agriculture" 53rd Annual Convention of Indian Society of Agricultural Engineers. 28-30 January, 2019. ISAE-2019/PDFE/FSQE-13.
- Bhardwaj, S., Sachin, Singh, V. K., Garg, M.K. (2019). Recent advances in Post-harvest Techniques for enhancing quality and safety of fresh Horticultural comodities. International symposium on Innopreneurship: A need of sustainable agriculture at CCS HAU, Hisar (Haryana) from February 02-03, 2019. Pp.282-283.
- Kumar, N., Kumar, S., Attkan, A.K., Singh, V.K. and Garg, M.K. (2019). Bioactive Compound Extraction from Waste Kinnow Peels. International Symposium on Innopreneurship: A need of Sustainable Agriculture, S4-PSMA-128. 2-3 February, 2019 at CCSHAU Hisar. Pp 261.
- Kumar, N., Kaur, P. Kumar, S., Attkan, A.K. (2019). Invention and comparison of Bio-nano composite and Petro-chemical based films in shelf life extension of Fresh Cherry Tomatoes. International Symposium on "Engineering Technologies for Precision and Climate Smart Agriculture" 53rd Annual Convention of Indian Society of Agricultural Engineers. 28-30 January, 2019. ISAE-2019/PDFE/HCP-22.
- Kumar, S., Kumar, N., Attkan, A.K., Singh, V.K. and Garg, M.K. (2019). Hermetic storage: sustainable and bio friendly alternative for grain storage. International Symposium on Innopreneurship: A need of Sustainable Agriculture, S4-PSMA-127. 2-3 February, 2019 at CCSHAU Hisar. Pp. 260-261.
- Kumar, S., Pingal, N., Kumar, N., and Attkan, A.K. (2019). Impact of Waxing and Various Treatments on Storability of Kinnow Fruit. International Symposium on "Engineering Technologies for Precision and

Climate Smart Agriculture" 53rd Annual Convention of Indian Society of Agricultural Engineers. 28-30 January, 2019. ISAE-2019/PDFE/HCP-21.

- Singh, V. K., Garg, M. K., Vijay (2019). Performance evaluation of Hand operated maize sheller. 53rd Annual Convention of Indian Society of Agricultural Engineers (ISAE) and International Symposium on " Emerging Technologies for Precision and Climate smart Agriculture" at Institute of Agricultural Sciences, Banaras Hindu University, Varanasi, UP during January 28-30, 2019.
- Sachin, Garg, M.K., Singh, V. K., Bhardwaj, S., Kumar, N. (2019) Advanced research in Food fortification of processed foods- A review. International symposium on Innopreneurship: A need of sustainable agriculture at CCS HAU, Hisar (Haryana) from February 02-03, 2019. Pp.84-85.

Other Publications

- Sunil Kumar, V.K. Singh and M.K. Garg (2018). Annual Report. Department of Processing & Food Engineering, COAE&T, CCSHAU, Hisar.

Lectures Delivered

- Dr. M. K. Garg delivered lecture on different types of Packaging to the participants of Training Course on Post-Harvest Techniques of Fruits and Vegetables organized by Department of Horticulture in collaboration with Students' Counseling and Placement Centre, DSW on CCS HAU, Hisar.

New equipment procured

Sr. No.	Name of Equipment	Quantity	Amount (Rs)	Name of Scheme
1	Autoclave	1	99,540	1093/T8-Agri State A
2	Aloe Vera Filleting cum Peeling machine	1	49,700	1124/C(a) Dte-R-1 State A
3	Garlic Stalk cutter machine	1	49,500	1124/C(a) Dte-R-1 State A
4	UVC Treatment Chamber Fabrication	1	47,200	1093/T-8 Agri State A
5	Angle Grinder Bosch 900 W	1	4,200	1093/T-8 Agri State A
6	Dusting Air Blower	1	2,999	1093/T-8 Agri State A
7	Washer cum Grader Machine	1	1,47,840	1093/T-8 Agri State A
8	Chaff Cutter Machine	1	33,630	1093/T-8 Agri State A
9	Mixer Machine	1	49,442	1093/T-8 Agri State A
10	Briquetting Machine	1	49,056	1093/T-8 Agri State A

11	Transformer Adopter	1	3,450	1093/T-8 Agri State A
12	Multipurpose Food Processing Machine Small	1	49,855	1225/C(a) Dte R-1- Agri State A
13	Food Waster Processor	1	18,062	1225/C(a) Dte R-1- Agri State A
		Total	**604, 474**	

Infrastructure developed/ strengthened

- Labs were got renovated.

Award/ Honours -

- Memento of appreciation to Dr. M. K. Garg from the Vice-chancellor for grateful recognition & remarkable efforts in the field of Intellectual Property Rights (IPR).
- The stall of the department got 2nd prize during the Kisan Mela at CCS HAU, Hisar

Patent filed

- Application for the design registration of pedal operated maize sheller was submitted.

New Initiatives taken during the Period

Following new machines were developed by the department

- HAU kinnow washer cum grader
- Cow dung based Hawan briquetting unit
- Small capacity biomass shredder
- Aloe vera leaf filleting cum gel extraction machine
- Garlic stalk cutter cum grading machine
- Bael cutter and scoop

International/National Conferences, Seminars, Training/ Refresher Course/Winter/Summer Schools Attended by Faculty Members

a) With University funding

- Dr. Arun K. Attkan participated in 31 Days Induction Training Programme at the Directorate of Human Resource Management from 29th November to 29th December, 2019 at CCS HAU Hisar.
- Dr. Arun K. Attkan participated in one day Workshop on Digital Field Book on December 12, 2018 at DHRM, CCSHAU, Hisar.

- Er. Sunil Kumar participated in National Conference by Indian Institute of Packaging on innovative Packaging Techniques for Food Products and Its safety Aspects at New Delhi on May 10th, 2019.
- Er. Sunil Kumar participated in 14 Days Training Programme on Robotics and Automation from July, 17-30, 2018 in Deans Committee Room of COAE&T, CCS HAU Hisar (Govt.).
- Er. Sunil Kumar participated in 31 Days Induction Training Programme at the Directorate of Human Resource Management from 29th November to 29th December, 2018 at CCS HAU Hisar.
- Er. Sunil Kumar participated in Brain Storming Session to discuss projects and various activities of AICRP on PHET centers at ICAR-CIPHET, Ludhiana (15/10/2019).
- Er. Sunil Kumar participated in two days International Symposium (February 2-3, 2019) on Innopreneurship: A need of sustainable agriculture and Rao Bahadur Dr. Ram Dhan Singh Fifth Memorial Lecture at CCS HAU, Hisar (DR/E.1/2019/3908 Dated: 02/02/2019).
- Er. Sunil Kumar participated in one Day Sensitization workshop (August 10, 2018) on Promotion of Agricultural Mechanization for In-Situ Management of Crop Residue in college of Basic Science and Humanities, CCS HAU, Hisar.
- Er. Sunil Kumar participated in one Day workshop (August 28, 2018) on Elsevier Empowering Agriculture Research in India in Association with CeRA in college of Basic Science and Humanities, CCS HAU, Hisar.
- Er. Sunil Kumar participated in 14 Days Training Programme on Robotics and Automation from July, 17-30, 2018 in Deans Committee Room of COAE&T, CCS HAU Hisar (Govt.).
- Er. Sunil Kumar participated in two days Indo-US Brain storming Workshop on Identification of Industry Needs and Skill gaps for Market driven Agriculture from 14-15 September, 2018 at Auditorium, COA.
- Er. Sunil Kumar participated in one day Workshop on Digital Field Book on December 12, 2018 at DHRM, CCSHAU, Hisar.
- Dr. Anil Panghal participated in 4 days 34th Annual Workshop of AICRP on PHET at TNAU, Coimbatore during March 12-15, 2019.
- Dr. Anil Panghal participated in 31 Days Induction Training Programme at the Directorate of Human Resource Management from 1st June to 1st July, 2019 at CCS HAU Hisar.
- Dr. Nitin Kumar participated in National Conference by Indian Institute of Packaging on innovative Packaging Techniques for Food Products and Its safety Aspects at New Delhi on May 10th, 2019 (COAE&T/19/1278-80).
- Dr. Nitin Kumar participated in 14 Days Training Programme on Robotics and Automation from July, 17-30, 2018 in Deans Committee Room of COAE&T, CCS HAU Hisar (Govt.).
- Dr. Nitin Kumar participated in 31 Days Induction Training Programme at the Directorate of Human Resource Management from 29th November to 29th December, 2019 at CCS HAU Hisar.
- Dr. Nitin Kumar participated in Brain Storming Session to discuss projects and various activities of AICRP on PHET centers at ICAR-CIPHET, Ludhiana (1/68/2018/PHET/Brain Storming/1081; 15/10/2019).
- Dr. Nitin Kumar participated in one day Sensitization workshop (August 10, 2018) on Promotion of Agricultural Mechanization for In-Situ Management of Crop Residue in college of Basic Science and Humanities, CCS HAU, Hisar.
- Dr. Nitin Kumar participated in one day workshop on awareness and use of Scopus database and Mendeley reference manager for faculty of the University on 20/01/2019 (Lib/PR/2019/12004-12084).

- Dr. Nitin Kumar participated in one Day workshop (August 28, 2018) on Elsevier Empowering Agriculture Research in India in Association with CeRA in college of Basic Science and Humanities, CCS HAU, Hisar.
- Dr. Nitin Kumar participated in Scientists' Meet on 15/09/2018 in COA, CCS HAU, Hisar (DEE/AD(FAS)/2018/13367-97).
- Dr. Nitin Kumar participated in two days Indo-US Brain storming Workshop on Identification of Industry Needs and Skill gaps for Market driven Agriculture from 14-15 September, 2018 at Auditorium, COA.
- Dr. Nitin Kumar participated in one day Workshop on Digital Field Book on December 12, 2018 at DHRM, CCSHAU, Hisar.
- Dr. Nitin Kumar attended a presentation on 3D digital phenotyping technologies at COBS&H on Feb 5/2019 (BSH/19/PA/702-802)
- Dr. Nitin Kumar organised a live event by "Pariksha pe Charcha 2.0" for students at COAE&T examination hall (DHRM/2018/219-222).

b) With funding from other agency

- Dr. A. K. Attkan and Er. Sunil Kumar participated in 7 Days residential Faculty Development Program (FDP) at MDU Rohtak from 24th May to 30th May, 2019.
- Dr. Nitin Kumar participated and successfully completed a **four weeks** online course, "Functional Foods: Concept, Technology and Health Benefits" organized by agMOOCs with distinction (October 8 – November 7, 2018).
- Dr. Nitin Kumar participated and successfully completed an **eight weeks** online course, "Fundamentals of Agricultural Extension" organized by agMOOCs (March 25 –May 20, 2019).

Extension works including trainings organized

Dr. V. K. Singh

- Demonstrated Agro processing machinery in Kisan Mela on 4-5 October, 2018 at CCS HAU, Hisar (Ref. No. PFE/18/798-806 dated 19.9.2018).
- Demonstrated Agro processing machinery at IOC Petrol pump, Distt. Bhiwani on 12.2.2019.

Dr. Arun Kumar Attkan

- Kisan Mela duty for two days from 4-5th October, 2018 in University Mela ground at CCS HAU Hisar.
- Kisan Mela duty for two days from 12-13th March, 2019 in University Mela ground at CCS HAU Hisar.
- Demonstration of Agro-Processing machineries for one day (15/02/2019) Krishi Mela organized in the Siwani village of Hisar district.

Er. Sunil Kumar

- Demonstration of Agro-Processing machineries for one day (15/02/2019) Krishi Mela organized in the *Siwani* village of Hisar district.
- Duty in Kisan Mela October 4-5, 2018 in University Mela ground at CCS HAU Hisar.
- Demonstration and sale of Agro Processing Centre Produce made under ICAR ELP in the university Kisan Mela at mela ground CCSHAU Hisar.

Dr. Nitin Kumar

- Demonstration and knowledge dissemination in two day Kisan Mela on October 4-5, 2018 in University Mela ground at CCS HAU Hisar (PFE/18/798-506).
- Demonstration of Agro-Processing machineries for one day (15/02/2019) *Krishi Mela* organized in the *Siwani* village of Hisar district (PFE/19/10-84).
- Demonstration and knowledge dissemination in two day Kisan Mela on March 12-13, 2019 in University Mela ground at CCS HAU Hisar (PFE/19/187-196).

For capacity building/monitoring/evaluation/reporting and institution building

Dr. V. K. Singh

- Worked as a Sports Coordinator of COAE&T, CCSHAU, Hisar (Ref. No. COAE&T/2014/A-2/4663-67 dated 19.9.2014).
- Performed duty as Coordinator of Internal evaluation Answer scripts of Theory examination under External examination system at college (COAE&T) level, CCSHAU, Hisar (Ref. COAE&T/2018/Acad./4279-80 dated 30.11.2018).
- Acted as a paper setter for B.Tech. (Agricultural Engineering) examination, course "Post Engineering of Horticultural Crops", JNKVV, Jabalpur (Ref. No. Exam/QP/305 dated 25.2.2019).

Dr. Arun Kumar Attkan

- Incharge of Fruit and Vegetable processing pilot plant of the department *wef.* April 01, 2019.
- Incharge of AICRP on PHET Hisar *wef.* June 19, 2019().
- Purchasing of equipment for the strengthening of laboratories in the department of Processing and Food Engineering.
- Member of purchase committee of the centre DDUCE-OF.
- Performed duty of invigilator at New Delhi from 23rd to 24th February, 2019 for Computer Based Test of CCSHAU Hisar (Admn CBT/19/645-71 Dated: 21/02/2019).
- Performed duty as member in college level committee constituted for the selection of UG\PG for their participation in summit to be held on September 16-22, 2019 at Tokyo NODAI.
- Nominated as Joint Secretary of HAU Science Forum wef. January 30, 2019.
- Assigned the duty to help newly admitted students for streamline registration.
- Member of advisory committee of Mr. Aman, 2017AE10M, M.Tech student of Deptt of Farm Machinery and Power Engg. for thesis seminar/Viva-Voce (FMPE/2019/750-62-18/07/2019).

Er. Sunil Kumar

- Purchasing of equipment for the strengthening of laboratories in the department of Processing and Food Engineering.
- Member of working committee in Experiential Learning Program (Centre of Agro-Processing and Engineering Services) of college of Agricultural Engineering & Technology in university.
- Member of working committee in Experiential Learning Program of Centre of Food Science & Technology in university.
- Member of working committee in Central laboratory of college of Basic Science & Humanities with effect from May 28, 2018.

- Incharge of Food Packaging and Storage Engineering laboratory of the department with effect from April 01, 2019.
- Nominated as faculty working on Artificial Intelligence in agriculture with effect from April 4, 2018.
- Member of department purchase committee of the Farm Machinery and Power Engineering
- Member of departmental Advisory committee of Processing and Food Engineering with effect from March 12, 2018.
- Member of advisory committee of Er. Vivek R Kamat, 2017AE07M, M.Tech student of Deptt of Farm Machinery and Power Engg for thesis seminar (12/06/2019).
- Dean Nominee for practical exam of PFE 410 (Hands on Training in Processing of Agricultural Produce 0+3) (16/05/2019)
- Member of advisory committee of Er. Sachin, 2018AE02D, Ph.D. student of Deptt of Processing and Food Engg (15/05/2019).
- Performed duty of invigilator at college of Agricultural Engineering and Technology, CCSHAU on 22/07/2019 in Entrance Test-2018 of LUVAS for admission to B.V.Sc & A.H and B.Tech programmes (ET/LUVAS/2018/2018/2-211 Dated: 11/07/2018).
- Performed duty of invigilator at New Delhi from 23rd to 24th February, 2019 for Computer Based Test of CCSHAU Hisar (Admn CBT/19/645-71 Dated: 21/02/2019).
- Performed as coordinator in the three days training on matlab fundamentals from 26th to 28 June, 2019 with 20 participants at COAE&T, CCS HAU Hisar (COAE&T/2019/PA/1967-92 Dated: 24/06/2019)
- Participated three days training on matlab fundamentals from 26th to 28 June, 2019 with 20 participants at COAE&T, CCS HAU Hisar (COAE&T/2019/PA/1967-92 Dated: 24/06/2019)

Dr. Nitin Kumar

- GeM buyer and consignee of the Department of Processing and Food Engineering for purchasing of equipment and strengthening of laboratories (SPO/EA/2019/5855-5955).
- In-charge of Food Engineering laboratory of the Department with effect from April 01, 2019 (PFE/19/263-69).
- Member in Department Purchase committee of Renewable & Bio-Energy Engineering, COAE&T (COAE&T/Estt./19/949-55 Dated: 09/04/2019)
- Appointed by the Dean, COAE&T to organize events, compile reports and disseminate knowledge to UG students pertaining to AICTE and MHRD schemes.
- Member of Departmental Advisory Committee of Processing and Food Engineering with effect from July 16, 2018 (PFE/18/D/596-605).
- Anti-Ragging/Vigilance Committee member with effect from July 24, 2018 (Endst No COAE&T/2018/Acad/2567-2603).
- Member of the College level committee for selection of UG/PG students on "Youth Transforming Thoughts on Sustainable Agriculture and Resource Management to Connect Local and Global Community" to be held on Sept. 16-22 at Tokyo NODAI.
- Nominated member for Institute Innovation Council for Startup Idea Competition in University on 29 April, 2019 (ABIC/2019/263-268 Dated: 19/04/2019).
- Assisted during movement from the hostel to the College for 1st year fresh students (Endst No COAE&T/2018/Acad/2567-64).

- Member of the Advisory Committee of two M.Tech students of FMPE, COAE&T for finalization of thesis seminar and thesis submission thereof (PGS/A2/2019/5635-38; PGS/A2/2019-5639-42; FMPE2019/326-32; FMPE2019/333-39)
- Assisted in the orientation programme for freshers on August 18, 2018 (Endst No COAE&T/2018/Acad/3007-35).
- Member of the organizing technical committee and purchase committee for Inter-College Golden Jubilee Youth Conclave Alive-2019 from April 19-26, 2019 at DSW (DSW/19/512-57).
- Advisor of 20 students from 1st year of COAE&T (COAE&T/2018/Acad/3349-51).
- Member of the Rapporteur Committee of Brain Storming Workshop under Institutional Development Programme (IDP) on September 14 and 15, 2018 (DCA/18/A-3/13416-56).
- Performed duty of invigilator at College of Agricultural Engineering and Technology, CCSHAU on 22/07/2018 in Entrance Test-2018 of LUVAS for admission to B.V.Sc & A.H and B.Tech programmes (ET/LUVAS/2018/2018/2-211 Dated: 11/07/2018).
- Performed duty of invigilator at New Delhi from 23rd to 24th February, 2019 for Computer Based Test of CCSHAU Hisar (Admn CBT/19/645-71 Dated: 21/02/2019).
- Performed duty of invigilator at College of Agriculture, CCSHAU on 01/06/2019 in Entrance Test (I)-2019 for admission to B.Sc. and MSc. programmes (COE/ET-I/2019).

Dr. Anil Panghal

- Purchasing of equipment for the strengthening of laboratories in the department of Processing and Food Engineering.
- Member of working committee in Centre of Bio-Nanotechnology (Central laboratory) of University with effect from May 23, 2019.
- In-charge of Food Analysis laboratory of the department with effect from April 01, 2019.
- Member of Departmental Advisory Committee of Processing and Food Engineering.
- Member of department purchase committee of the Basic Engineering (COAE&T/Estt./19/949-55 Dated: 09/04/2019)
- Member of advisory committee of Ms. Reema Devi, 2017HS10M, M.Sc. student of Department of Food and Nutrition for thesis seminar and submission (28/05/2019) (PGS/A2/2019/5225-28).
- Member of advisory committee of Ms. Neha, 2017HS16M, M.Sc. student of Department of Food and Nutrition for thesis seminar and submission (28/05/2019) (PGS/A2/2019/5220-24)
- Performed duties of invigilator at College of Agricultural Engineering and Technology, CCSHAU on 21/05/2019, 27/05/2019, 28/05/2019 and 31/05/2019 in Annual Examination-2019 (COAE&T/2019/Acad/1227 Dated: 01/05/2019).
- Performed duty of invigilator at College of Agriculture, CCSHAU on 25th May, 2019 for Section office/JE and Lib Asstt. Recruitment test of CCSHAU Hisar.
- Member of College level Committee for the selection of UG/PG students for participation in summit on Youth Transforming Thoughts on Sustainable Agriculture and Resource Management to Connect local and Global Community. (COAE&T/2019/999-1003 dated 15.04.2019)

Assignments and duties performed by the faculty members

Dr. M. K. Garg

- Officer on Special Duty to Vice-Chancellor, CCS HAU, Hisar
- Coordinator, Project Monitoring Cell, CCS HAU, Hisar
- Chairperson of Investment Committee, CCS HAU, Hisar
- Chairman, Grievance Committee, COAE&T, CCS HAU, Hisar
- Member of Project Monitoring & Review Committee of Agri business incubation centre, CCSHAU, Hisar.
- Member of Institute Management Committee, CIPHET, Ludhiana.
- Member of National Board of Accreditation (NBA) team to evaluate engineering programmes at A.D.Patel Institute, Anand from 12th to 14th April, 2017.
- Member, Agricultural & Food Processing Sectional Committee, FAD 20, Bureau of Indian Standards, New Delhi
- Member of Academic Council, CCS HAU, Hisar
- Chairperson of Technical Session on Diversified Agriculture and Value Addtion during International symposium on Innopreneurship: A need of sustainable agriculture from February 2-3, 2019.
- Expert committee member for the preparation of draft of new statutes of MHU, Karnal
- Member to review/revise CCSHAU Account Code Vol. II
- Life member of Indian Society of Agricultural Engineers, Life member of Association of Food Scientists & Technologists
- Delivered lectures during induction training courses to the newly recruited faculty on RTI Act.
- Member, PG Board of Studies in Food Technology, MDU, Rohtak
- Member, Board of Studies, College of Agricultural Engineering & Technology
- Member, Board of Studies, Center of Food Science & Technology
- Member for the screening of applications for recruitment to the post of Assistant Professor (PHT) of MHU.
- Member of selection committee for selection to the post of SRF and JRF under IDP project; Executive Engineer (PH) through promotion; Business manager, Assistant Manager, Business Executive, Office Assistant etc under RKVY-Agri Business Incubator project at CCSHAU, Hisar.
- Worked as Professional Counsellor to curb the menace of ragging in the college
- Participated in *Swachh Bharat* Campaign at CCSHAU, Hisar
- Evaluated comprehensive written exam of Ph.D. students of CFST
- Member, practical test for recruitment of photographer, video-production and Lab Assistant at CCSHAU, Hisar
- Member of various committees constituted by Worthy Vice-chancellor from time to time

The technical papers of the following national/international scientific journals were reviewed during 2018-19:

- JFST-D-18-02813, Journal of Food Science & Technology (NAAS rating – 7.80)
- JFST-D-19-00207, Journal of Food Science & Technology (NAAS rating – 7.80)

Theses/Reports of following universities/institutes were evaluated:

- Evaluation of M.Tech thesis of IARI, Pusa

Dr. V.K. Singh

- Acted as a paper setter for B.Tech. (Agricultural Engineering) examination, course "Fruits & Vegetables Processing Engineering", JNKVV, Jabalpur (Ref. No. Exam/QP/303 dated 1.3.2019).
- Worked as paper setter for the B.Tech. (Food Technology), course "Fundamental of Food Processing Engineering", GJUS&T, Hisar (Ref. SECY/2019/5318 dated 18.4.2019).
- Acted as a paper setter for M.Tech. (Agricultural Engineering) examination, course "Energy Management in Food Processing Industries", JNKVV, Jabalpur (Ref. No. Exam/QP/303 dated 1.3.2019).
- Performed duty as Invigilator in Entrance Test (I)-2019 of CCSHAU on 8.6.2019(Ref. No. COE/ET-I/2019 dated 28.5.2018).
- Performed duty as Dean, PGS nominee for advisory committee of PG student, CCSHAU, Hisar.
- Acted as member from minor subject for advisory committee of PG student, FMPE, CCSHAU, Hisar (Ref. No. FMPE/18/806-12 dated 22.2.2018).
- Member of Departmental purchase committee for the Department of Farm Machinery & Power Engineering (Ref. COAE&T/Estt./19/949-55 dated 9.4.2019).
- Performed Invigilation duty in examination of B.Tech. (Agril. Engg.), M. Tech. of COAE&T, CCS HAU Hisar.
- Member in committee's of purchase quotations, inspections, condemnations for the different Department of COAE&T, CCSHAU, Hisar.
- Incharge, Engineering Properties of Biological Materials lab of PFE, COAE&T, CCSHAU, Hisar.
- Performed duty in Kisan Mela 12-13 March, 2019 at CCS HAU, Hisar (Ref. No. PFE/19/187-196 dated 7.3.2019).
- Demonstrated Agro processing machinery in Kisan Mela on 4-5 October, 2018 at CCS HAU, Hisar (Ref. No. PFE/18/798-806 dated 19.9.2018).
- Demonstrated Agro processing machinery at IOC Petrol pump, Distt. Bhiwani on 12.2.2019.
- Worked as a Sports Coordinator of COAE&T, CCSHAU, Hisar (Ref. No. COAE&T/2014/A-2/4663-67 dated 19.9.2014).
- Performed duty as Co-coordinator of Internal evaluation Answer scripts of Theory examination under External examination system at college (COAE&T) level, CCSHAU, Hisar (Ref. COAE&T/2018/Acad./4279-80 dated 30.11.2018).
- Acted as a paper setter for B.Tech. (Agricultural Engineering) examination, course "Post Engineering of Horticultural Crops", JNKVV, Jabalpur (Ref. No. Exam/QP/305 dated 25.2.2019).

Er. Sunil Kumar

- Nominated member for Institute Innovation Council for Startup Idea Competition in University on 29 April, 2019 (ABIC/2019/263-268 Dated: 19/04/2019).
- Assigned duty for regular update of college website for all departments of COAE&T with effect from January 2, 2018.
- Assigned duty as a PG faculty (as a special case) in Department of Processing and food Engineering for teaching and assisting in research work of PG students with effect from November 17, 2017.
- Incharge of video conference Hall in COAE&T with effect from June 6, 2018.
- Member in Department Purchase committee of Farm Machinery and Power Engineering (COAE&T/Estt./18/1031 Dated: 13/04/2018)

- Member in College Disciplinary committee (COAE&T/2019/Acad./409-17 Dated: 14/02/2019)
- Member in inspection committee of Renewable and Bio-Energy Engineering (COAE&T/2018/Estt./3194 Dated: 05/09/2019)
- Proposed as committee members for Physical Verification of stores in Dean, COAE&T on 09/04/2019 (COAE&T/Estt./19/926-35).
- Committee members for Physical Verification of stores in Instrumentation Cell, COAE&T (COAE&T/Estt./18/1074 Dated: 20/04/2018).
- Exam duty for mid and Final in college (COAE&T/2019/Acad./564-81 Dated:02/03/2019; COAE&T/2018/Acad./3390-3411 Dated: 24/09/2018Mid and COAE&T/2019/Acad/12 Dated: 01/05/2019 Final)
- Nominated by the Head of Deptt for the purchase of Deptt of Processing and Food Engineering (PFE/19/61-63 Dated: 31/01/2019; PFE/19/41-43 Dated: 21/01/2019)
- Nominated to participate in Scientist's Meet on 15/09/2018 in COA, CCSHAU Hisar (DEE/AD (FAS)/2018/13367-97 Dated: 11/09/2018)
- Compiled Annual Report for Deptt. of Processing and Food Engineering for the 2017-18.

Er. Arun Kumar Attkan

- Assigned duty for college librarian with effect from August 21, 2017.
- Nominated as member in Anti Ragging/Vigilance Committee (COAE&T/2019/Acad/2552-72-18/07/2019).

Dr. Nitin Kumar

- **Additional Charge:** Assistant Coordinator, International Affairs, DPGS since 05/10/2018 (Admn.F./3/2018/32945-84).
- **Additional Charge:** Incharge, Summer Training/Student READY Programme since 14/01/2019 (COAE&T/2019/Estt./161).
- **Additional Charge:** Advisor, COAE&T, Literary & Debating Society, DSW since 15/10/2018 (DSW/2018/5784).
- Assigned duty for regular update of website for Department of PFE of COAE&T, CCS HAU with effect from 28/03/2019 (BHS/19/2136-2156).
- Assigned duty as a PG faculty in Department of Processing and Food Engineering for teaching and assisting in research work of PG students with effect from July 4, 2018.
- Preparation of biannual report for effective implementation of sexual harassment of women at workplace (Prevention, Prohibition and Redressal Act 2013) (CFST/2018/1830-1930).
- Member in inspection committee of Renewable and Bio-Energy Engineering (COAE&T/2018/Estt./3194 Dated: 05/09/2019).
- Conducted Annual Physical Verification of stores, PFE for the year 2018-19 (PFE/PV/19/437-39).
- Examination duty for summer semester RNT courses in COAE&T on 04/08/2018 (COAE&T/2018/Acad/2980).
- Examination duty for mid and Final term examination in college 2018-19 (COAE&T/2019/Acad./564-81 Dated: 02/03/2019; COAE&T/2018/Acad./3390-3411 Dated: 24/09/2018Mid and COAE&T/2019/Acad/12 Dated: 01/05/2019 Final).

- Paper setter for Guru Jambheshwar University for Science & Technology, Hisar and Central Agricultural University, Imphal.
- Conducted AICTE-MHRD-Innovation Cell-Smart India Hackathon 2019
- Organization of Literary Festival at DSW, CCS HAU, Hisar on 16/10/2018 (DSW/18/5824-36)
- Nominated by Dean, COAE&T to encourage and enroll 1st year students for SachVijaya Scholarship Programme (Acad./18/A4/26974-77).
- Compilation of information for gender champions at COAE&T (CHS/A4/18/4591-93).
- Compilation of information for quarterly newsletter of the Department.
- Nominated by the Head of Deptt for attending project evaluation meeting of the Directorate of Research on January 24, 2019 (DR/ADR/2019/3433-61).
- Compilation of the information for National Institutional Ranking Framework (NIRF) (COAE&T/2018/Estt/3832-37).
- Nominated by Dean, COAE&T to sensitize and encourage undergraduate students for attending various training and internship programmes organized by MHRD, AICTE and other agencies.
- Member of the inspection committee (Rep. HOD PFE) for repair of poly net house at Deptt. of Horticulture, COA, CCS HAU on 15/02/2019 (Hort./19/617-20).
- Compilation of information of COAE&T for digitization of CCS HAU (Admn.R.4/2019/5532-51).
- Member of equipment specification committee for purchase of sucrolyzer and muffle furnace (SPO/P1/2019/6105-6108).
- Attended 7th Central Purchase Committee meeting (Rep. HOD PFE) held on 16/03/2019 in the committee room of COBS&H on 07/03/2019 (SPO/SSS/19/6212-30).
- Member of the committee (Rep. HOD PFE) constituted by Deptt. of Horticulture, COA for collecting quotation of naturally ventilated polyhouse (Hort.19/1007-10).
- Nominated by Dean, COAE&T for inspection of the newly fabricated machines in Department of PFE (PFE/19/208-211; PFE/19/212-215).
- Attended 8th Central Purchase Committee meeting (Rep. HOD PFE) held on 16/03/2019 in the committee room of COBS&H (SPO/SSS/19/6486-6510).
- Member of the Stage Coordination Committee in International Symposium on Innopreneurship: A need of Sustainable Agriculture held on Feb 2-3, 2019.
- Nominated by Head to attend Technical Programme for Rabi oilseed section on 27/09/2018 at GPB, COA, CCS HAU, Hisar (HAU/HOS/18/686-715).
- Nominated by Head to attend Technical Programme for Rabi Forage section on 29/09/2018 at GPB, COA, CCS HAU, Hisar (FS/2018-19/927-976).
- Represented Dean, COAE&T for inspection of earth filling work in front of COBS&H on 20/03/2019 (BHS/19/SK/2079-82).
- Represented Dean, COAE&T for inspection of Basketball court near DSW on 19/03/2019 (DSW/19/8978-80).
- Compilation of Appraisal Report of Deptt of PFE, COAE&T from November 2018-April 2019 (DR/19/ADPP/15604-60).
- Member of equipment specification committee for purchase of digital headspace gas analyser (SPO/P1/2019/1819-21).
- Represented HOD, FMPE by the order of Dean, COAE&T to inspect spare parts of seed processing plant at Director Farm, CCS HAU on 10/06/2019 (DF/2019/SKseeds/1845-48).

Dr. Anil Panghal

- Purchasing of equipment for the strengthening of laboratories in the department of Processing and Food Engineering.
- Member of working committee in Centre of Bio-Nanotechnology (Central laboratory) of University with effect from May 23, 2019.
- Incharge of Food Analysis laboratory of the department with effect from April 01, 2019.
- Member of Departmental Advisory Committee of Processing and Food Engineering.
- Member of department purchase committee of the Basic Engineering (COAE&T/Estt./19/949-55 Dated: 09/04/2019)
- Member of advisory committee of Ms. Reema Devi, 2017HS10M, M.Sc. student of Department of Food and Nutrition for thesis seminar and submission (28/05/2019) (PGS/A2/2019/5225-28).
- Member of advisory committee of Ms. Neha, 2017HS16M, M.Sc. student of Department of Food and Nutrition for thesis seminar and submission (28/05/2019) (PGS/A2/2019/5220-24)
- Performed duties of invigilator at College of Agricultural Engineering and Technology, CCSHAU on 21/05/2019, 27/05/2019, 28/05/2019 and 31/05/2019 in Annual Examination-2019 (COAE&T/2019/Acad/1227 Dated: 01/05/2019).
- Performed duty of invigilator at College of Agriculture, CCSHAU on 25th May, 2019 for Section office/JE and Lib Asstt. Recruitment test of CCSHAU Hisar.
- Member of College level Committee for the selection of UG/PG students for participation in summit on Youth Transforming Thoughts on Sustainable Agriculture and Resource Management to Connect local and Global Community. (COAE&T/2019/999-1003 dated 15.04.2019)

List of thesis submitted by M.Tech. Students (as on 30.06.2019)

Sr. No	Name	Admission No	Title	Name of Advisor
1	Rajeev Gupta	96AE86M	Mathematical modeling for environment conditions in an evaporative cooling chamber	Dr. M. K. Garg
2	Ravi Gupta	97AE116M	Study of milling factors on basmati paddy (Taraon Basmati & Basmati 370) for head rice recovery	Er. M.C. Kashyap
3	Sandeep Mann	97AE117M	Design and development of knowledge base seed storage information system	Dr. M. K.Garg
4	Pawan Veer	98AE124M	Development and testing of straw densification machine	Er. Surjeet Jain
5	Pratima Bajaj	98AE125M	Investigation of mass transfer during osmotic dehydration of button mushrooms (*Agaricus bisporus*)	Er. Surjeet Jain
6	Ramachandra, C.T.	2000AE135M	Equilibrium moisture content and drying characteristics of selected medicinal plants	Er. Surjeet Jain
7	Preeti Panda	2000AE137M	Osmo-air drying of grapes for raisin preparation	Dr. M.K.Garg
8	Anil Kumar	2000AE136M	Development of an integrated energy system for a goshala complex	Er. Surjeet Jain
9	Manjunatha	2001AE229M	Osmo-convective dehydration of cauliflower	Er. J. M. Wadhwa
10	Ritu Raj Mehta	2002AE110M	Comparative evaluation of different drying methods to dry liquorice (mulhatti)	Er. Surjeet Jain
11	Vijay Kumar Singh	2002AE111M	Effect of packaging materials on the shelf life of moisture sensitive foods	Dr. M. K.Garg
12	Balwan Singh	2002AE108M	Comparative evaluation of different drying methods for drying of kasuri fenugreek leaves	Er. M.C. Kashyap
13	Raj Kumar	2003AE208M	Drying behaviors of rapeseed (toria) under thin layer conditions	Er. Surjeet Jain
14	Sujata Nayak	2003AE210M	Simulation and optimization of a solar dryer	Dr. M. K.Garg

15	Sipna Deshmukh	2005AE114M	Effect of edible coatings & packaging method on shelf life of button mushroom (Agaricusbisporus)	Er. Surjeet Jain
16	Md. Mahfooz Aalam	2006AE137M	Development and testing of packages for transportation of guava	Dr. M.K.Garg
17	Indu	2006AE136M	Optimization of process parameters of soymilk and Tofu production unit	Er. Surjeet Jain
18	Kailash Bhatt	2007AE80M	Development of a steam blancher for vegetables	Dr. M.K.Garg
19	Yogita	2007AE82M	Method of extraction of anthocyanin pigments from red rose	Er. Surjeet Jain
20	Yogender Singh	2008AE96M	Comparative performance of evaporative cool chambers using alternative materials for storage of fruits and vegetables	Dr. Y. K. Yadav
21	Rajeshwari Patti	2008AE97M	Effect of moisture content on physical properties of coarse grains	Er. Surjeet Jain
22	Chavan Sandeep Pandhari	2009AE208M	Development of a dehumidified air dryer	Dr. M. K.Garg
23	Abhishek Shukla	2009AE209M	Development of paddle operated petha (ashgourd) pricking machine.	Dr. D. K. Sharma
24	Sunil	2009AE210M	Optimization of biogas slurry use for digestion of an admixture of kitchen waste & cattle dung	Dr. Y. K. Yadav
25	Aarjoo	2010AE170M	Performance evaluation of solar tunnel dryer for round the year use	Dr. Yadvika
26	Nitesh	2010AE172M	Development of solar regenerated desiccant dryer	Dr. Y.K. Yadav
27	Patil Rushikesh Ashok	2010AE173M	Mass transfer kinetics of aloe vera during osmo-convective dehydration	Dr. M.K. Garg
28	Anarase Dattatray Arjun	2011AE124M	Development of decision support tool for design of commercial grain storage	Dr. M.K. Garg
29	Arun Kumar	2011AE125M	Development of a desiccant based food drying system	Dr. Y.K. Yadav

30	Sunil Kumar	2012AE04M	Comparative evaluation of quality changes in stored wheat in hermetic silo bags and conventional methods	Dr. M.K. Garg
31	Nitin Kumar	2012AE01M	Design, development and performance evaluation of foot operated aonla pricking machine	Dr. D.K. Sharma
32.	Sushant Bhardwaj	2013AE02M)	Techno-economic feasibility studies of a solar regenerated desiccant integrated seed drying system	Dr. Yadvika
33.	Vinay	2014AE04M	Design and development of pedal operated maize sheller	Dr.V. K. Singh
34.	Sandeep	2014AE03M	Spent mushroom substrate utilization using different portable technologies	Dr. Yadvika
35.	Raveena	2015AE02M	Energy use pattern of pearl millet production and processing	Dr. Yadvika
36.	Ashwini SC	2016AE01M	Effect of ohmic heating on oil recovery from rice bran	Dr. M.K. Garg
37.	Sachin	2016AE02M	Effect of microwave heating on extraction of essential oil from turmeric (Curcuma longa L.)	Dr. V. K. Singh
38.	Annu	2016AE04M	Techno-economic Evaluation of Solar Biomass Shredder	Dr. Yadvika
39.	Rihan Patel	2017AE01M	Detection of insect infestation level in wheat by using sensors	Dr. M. K. Garg
40.	Sapna	2017AE03M	Engineering Interventions for energy efficient management of paddy Straw	Dr. Yadvika
41.	Ravi Kumar	2017AE04M	Process development for microwave assisted extraction of glycyrrihizic acid from mulhatti	Dr. V.K. Singh
42.	Charan Singh	2017AE06M	Design and development of garlic stalk cutter (Allium Sativum) machine	Dr. V.K.Singh

Address and Telephone number of staff members

S.No.	Name (Dr/Mr./Mrs.)	Address	Date of birth	Telephone	E-mail
1	Dr. M.K.Garg	8/15, New Campus, HAU	17.09.60	9416674060	mkgarg.hau@gmail.com
2	Dr. Ravi Gupta	10/2, Old Campus, HAU, Hisar	23.08.74	7501112404	ravigupta2300@yahoo.com
3	Dr. D. K. Sharma	10/110, Farm Colony, HAU	04.11.64	9416846103	dksharma.hau@gmail.com
3	Dr. V.K.Singh	10/107, New Campus, HAU	20.10.77	9992661719	vijurss@gmail.com
4	Er. Sunil Kumar	20, Defence Colony, Hisar	30.10.90	9990177757	sksaroha@hau.ac.in
5	Dr. Arun Kumar Attkan	Gali No. 7, Jawahar Nagar, Hisar	16.11.88	9416713102	arun.pfe@hau.ac.in
6	Dr. Nitin Kumar	36, Berwal Sadan, Krishna Nagar, Hisar	30.12.89	9466263889	nitin@hau.ac.in
7	Dr. Anil Panghal	7 Vinayak Nagar, Kaimri Road Hisar	22-02-2019	9988049760	anilpanghal@hau.ac.in
8	Shri Gopal	LuxmiVihar Colony	01.04.61	9812454946	
9	Savita*	B-11, WWH, HAU	02.06.74	9996259026	
10	Mahadev	VPO Dhigtana	03.02.64	9466611905	
11	Gopi Ram	178, Inqlab Friends Colony, Azad Nagar	20.03.68	7027275656	
12	Ravi Kant	H.No. 12, Block C, New Model Town	20.02.85	9728753232	
13	Naveen	VH 14/4, Old Campus, HAU, Hisar	07.10.85	9466489026	

*Transferred to CFST on 22.09.2018 after her promotion.

List of retired faculty members

S. No.	Name (Dr./Er.)	Present address	Date of retirement	Telephone number
1	M.C. Kashyap	HIG-292, Sector 71, Mohali	30.06.06	9855600684
2	Rati Ram Gupta	13, Geeta Colony, Salarpur Road, Kurukshetra	30.06.07	9315867908
3	Surjeet Jain	4, PLA, Hisar	30.09.10	9416397556
4	J.M.Wadhwa	Rohtak	31.10.15	9416147699

Roster of Head of Department

S. No.	Name	Date	
		From	To
1	Dr. D.P. Kataria*	March, 1996	25.02.1998
2	Dr. R.R. Gupta	26.02.1998	26.02.1999
3	Dr. D.P. Kataria*	27.02.1999	04.05.1999
4	Er. Surjeet Jain	05.05.1999	04.05.2002
5	Prof. J.M. Wadhwa	05.05.2002	28.05.2004
6	Dr. Pratap Singh*	29.05.2004	30.10.2007
7	Dr. Y.K. Yadav	31.10.2007	30.10.2011
8	Dr. M.K. Garg*	31.10.2011	22.10.2012
9	Dr. Saroj Jeet Singh*	23.10.2012	31.12.2012
10	Dr. A.K. Goel*	01.01.2013	31.05.2013
11	Dr. M.K. Garg	01.06.2013	Continuing

*Additional charge as Dean, COAE&T

College of Agricultural Engineering and Technology at a Glance

Haryana Agricultural University Established	: 2nd February, 1970
Department of Agricultural Engg. Established	: 2nd February, 1970
B. Tech. (Agril. Engg.) Programme Started	: August, 1987
College of Agril. Engg. and Technology Established	: March, 1992
College of Agril. Engg. and Technology Inaugurated	: August, 1992
M. Tech. (Agril. Engg.) Programme with Specializations in FPM and SWE Started	: August, 1993
Department of Farm Power & Machinery and Department of Soil & Water Engineering Established	: September, 1993
Department of Agril. Processing and Energy Established	: March, 1996
M. Tech. (Agril. Engg.) Programme with Specialization in Agril. Processing and Food Engineering Started	: August, 1996
Section of Basic Engineering Established	: October, 1996
Departments Renamed As - Farm Machinery & Power Engineering - Processing & Food Engineering	: September, 2010
Ph.D. (Agril. Engg.) Programme with Specializations in FPM, SWE and FMPE Started	: 2016
Department of Renewable and Bio-Energy Engineering and Department of Basic Engineering Established	: March, 2017

Teaching Load of the Department

S.No.	Course No.	Course Title	Credit Hours	Contact Hours
		SEMESTER-I		
1	PFE 301	Dairy and Food Engineering	2+1	4
2	PFE 304	Protected Cultivation & PHT (For B.Sc. (Hons.) Agriculture)	1+1	15
3	PFE 390	Summer Training-I	0+3	6
4	PFE 402	Design and Maintenance of Green House	2 + 1	4
5	PFE 403	Food Packaging Technology (Elective-II)	2 + 1	4
6	PFE 401	Food Processing Plant Design and Layout	2+1	4
7	PFE 490	Summer Training-II	0+3	6
8	PFE 411	Project-I	0+3	54
9	PFE 503	Advanced Food Process Engineering	2+1	4
10	PFE 505	Energy Management in Food Processing Industries	2+1	4
11	PFE 510	Food Packaging	2+1	4
12	PFE 595	Industry/Institute Training	0+1	1
13	PFE 599	Master's Research	-	22
14	PFE 602	Advances in Food Processing	2+1	3
15	PFE 603	Mathematical Models in Food Processing	3+0	3
16	PFE 604	Advances in Drying of Food Materials	2+1	4
17	PFE 609	Special Problem in Processing and Food Engg.	0+1	2
18	PFE 691	Doctoral Seminar	1+0	1
19	PFE 699	Doctoral Research	-	20
		SEMESTER-II		
1.	PFE 201	Engineering Properties of Agricultural Produce	2+1	4
2	PFE 302	Agricultural Structures & Environmental Control	2+1	4
3	PFE 303	Drying and Storage Engineering	2+1	4
4	PFE 410	Hands on Training in Processing of Agricultural Produce	0+3	6
5	PFE 412	Project on Processing and Food Engineering – 1I	0+3	18
6	PFE 391	Under-graduate seminar	0+1	2

7	PFE 305	Renewable Energy (for Agric. Students)	1+0	15
8	PFE 501	Transport Phenomena in Food Processing	2+1	4
9	PFE 502	Engineering Properties of Biological Materials		4
10	PFE 504	Farm Structures & Environmental Control	2+1	4
11	FST 503	Food Engineering	2+1	4
12	PFE 601	Textural & Rheological Characteristics of Food Materials	2+1	4
13	PFE 513	Storage Engineering & Handling of Agricultural Products	2+1	4
14	PFE 605	Agricultural Waste and By Product Utilization	2+1	4
15	PFE 591	Master's Seminar	0+1	1
16	PFE 692	Doctoral Seminar-II	1+0	1
17	PFE 599	Master's Research	-	34
18	PFE 699	Doctoral Research	-	42

Teaching load during semester –I = 165 contact hours per week
Teaching load during Semester – II = 159 contact hours per week
Total Teaching Load = 165+ 159 = 324 contact hours

Average Teaching load per semester = 324/2 = 162 contact hours

List of laboratories and their lab Incharge

Sr. No.	Name of Laboratory	Name of Incharge	Supporting Staff
1	Engineering Properties Lab	Dr. V. K. Singh	Sh. Mahadev
2	Fruits and Vegetables Processing Lab	Dr. Arun Kumar Attkan	Sh. Mahadev
3	Food Analysis Lab	Dr. Anil Panghal	Sh. Shrigopal
4	Food Packaging and Storage Engineering lab	Er. Sunil Kumar	Sh. Shrigopal
5	Food Engineering Lab	Dr. Nitin Kumar	Sh. Mahadev
6	Engineering Workshop	Dr. Arun Kumar Attkan	Sh. Gopi
7	Agro Processing Centre	Dr. Arun Kumar Attkan	Sh. Gopi/ Sh. Mahadev

Department Advisory Committee (Upto 30.06.19)

Chairperson : Dr. M.K. Garg, Professor and Head

Secretary : Dr. V.K. Singh

Members : Dr. Arun Kumar Attkan, Er. Sunil Kumar, Dr. Nitin Kumar, Dr. Anil Panghal