

Enzymatic Pre-treatment in the Processing of Pigeon pea

**A project sponsored under
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DEPARTMENT OF AGRICULTURE AND COOPERATION

Performa for Annual progress report

Section A: General Information

❖ **Project title : Enzymatic Pre-treatment in the Processing of Pigeon pea**

❖ **Name, Designation, Address, Phone Nos. and e-mail id of PI**

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❖ **Name and Address of the Institute/ Organization.**

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❖ **Name, designation, phone nos. and e-mail id of head of the Organization.**

Director of Research

Junagadh Agricultural University,

JUNAGADH – 362001

❖ **No. and date of DAC sanction order.**

F.NO.CPS-18-20/2014 NFSM,GOI. DAC(NFSM-Cell) dated 14/08/2014

❖ **Date of inception and duration of the project.**

14/08/2014 and three years (2014-17)

Section B. Technical

❖ Objectives:

The following objectives were fixed for the project and duration is about three years for the year 2014-2017.

1. To study the physico-chemical properties of pigeon pea grains.
2. To study the effect of enzymatic pre-treatments on loosening of seed coat of pigeon pea grains and milling quality of enzyme treated pigeon pea.
3. To determine the effect of enzymatic pre-treatments on protein content of dhal.
4. To study the cooking quality of dhal
5. Establishment of pulse mill for demonstration purpose

❖ Activities approved under each half year.

1st Half

1. Recruitment of staff position of schemes:

Recruitment of one Senior Research fellow and one laboratory technician has been approved and advertisement for filled up this position was given and interviewed on dated 15/10/2014. Mr. Vishal Kukadiya (M. Tech. in processing and food Engineering). Laboratory technician was not filled during these days. But after the advertisement on 20/5/2015 new recruitment was filled up by the Rathod Ravikumar as laboratory technician. Means first time line of objectives were fulfilled and project work starts with the preliminary laboratory work.

2. Purchase of machineries:

The analytical equipments' and miscellaneous expenditure are only admissible under recurring contingency therefore we have purchased one pH meter (pH 700 Benchtop meter with epoxy probes SS-ATC probes with stand of Eutech company) of Rs. 36908/-

The analytical balance (Model-RA 2012) for weighing for the enzymes/chemicals were purchased at a price of Rs. 84094 /-

For the commercial trial runs for the processing of Dahl, according to objectives procedure were modified for the enzymes treatments as well as proper mixing and moisturizing of dahl.

Ribbon blender was purchased with tailor made fabrication according to the flow chart and required specification for 150 kg pigeon pea from Pledge International, Ahmedabad with the price of Rs.78750/ only.

For the biochemical analysis and analyzing the effect of enzymes on processing of pigeonpea, required chemicals were purchased with the prices of Rs. 52511/- during the year 2014-2015.

For initiation and establishment of the process dhal mill plant, scientists have visited to Baroda GIDC and discussed with the dhal mill manufacturing unit for preparation of this unit and its cost.

❖ **Activity-wise progress against targets fixed.**

Above both the activities have been fulfilled accordingly.

IInd Half

❖ **Preliminary trial with different enzyme concentration, pH, time and temperature of incubation was carried out as under.**

The effect of enzymatic pre-treatments on loosening of seed coat of pigeon pea grains and milling quality of enzyme treated pigeon pea were noted.

Methodology:

The effects of four independent variables viz., enzyme concentration, incubation time, incubation temperature and tempering water pH on hulling efficiency, protein content and cooking time are being continue with the first level or preliminary trials has been successfully implemented. The enzymatic hydrolysis of Pigeon pea (*Cajanuscajan L*) with Variety: BDN-2 grain (Purchased from Seed Science and Technology Department of Junagadh Agricultural University).

Enzyme preparation:

Enzyme (Enzymes: Xylanase, Pectinase, Cellulase) mixture were prepared according to the following concentration for the loosening of seed coat for the preliminary trial at laboratory. The concentration were fixed for the all three cell wall degrading enzymes viz., Xylanase :Pectinase : Cellulase at the ratio of (2:1:1) mixed with the quantity of 425gm for 1000 gm of pigeon pea. Similarly the same ratio were fixed for the trial 1,3, and 5 whereas for the trial 2,4 and 6 it was 275mg/1kg seed of pigeonpea for the preliminary trial at the laboratory (**Table 1**).

The two temperature viz., 50°C and 40°C were utilized and similarly for the

preparation of this enzymes pH 5.5 was maintained. About two incubation period were studied for 6 and 10 hours for the proper mixing of the enzymes with the seed coat.



Enzymes: Pectinase: Xylanase: Cellulase



Ribbon Blender



Laboratory Scale Incubator

Drying of the seed:

After the completion of each incubation, seeds were dried in tray dryer at 55⁰C and maximum up to 60 ⁰C up to moisture content reached near to 10 % (wb) for nullifying the effect of enzymes. After that, seed coat was removed easily with the pinch of thumb and finger.



Tray Dryer

Table 1: Preliminary experimental trial

Treatments	Enzyme concentration mg/100gmdried sample	Incubation Time in hours	Temperature (°C)	pH
1	42.5	10	50	5.5
2	27.5	10	50	5.5
3	42.5	6	50	5.5
4	27.5	6	50	5.5
5	42.5	10	40	5.5
6	27.5	10	40	5.5



Easily Removing of seed Coat by Pinching



Pigeon Pea into two halves parts

- ❖ **Inferences drawn, if any, under each activity.**
- ❖ **Results of practical utility.**

Analysis is under progress for the remaining trials. Continues work batch is started and after this preliminary trials, proper incubation, temperature and pH will utilized for the commercial and pilot project based on this study.

Section C: Budget allocation and expenditure:

Information on progressive budgetary allocation and expenditure along with a statement of release of funds made by DAC .

(a) Allocation and Expenditure (Rs. In Lakhs)

S. No.	Item	I Year		II Year		III Year	
		Allocation/ Released	Expenditure	Allocation/ Released	Expenditure	Allocation/ Released	Expenditure
1.	Contractual Services	2.95	0.83	2.95		2.95	
2.	Operations	4.0	0.60	3.0		3.0	
3.	Travel	0.50		0.50		0.50	
4.	Items/inputs						
5.	Equipment	29.50	1.99	2.00		2.25	
6.	Workshops/ Training						
7.	Miscellaneous						
8.	Report writing						
	Total	36.95	3.42	8.45		8.7	

(b) Amount of funds (Rs. In Lakhs) released with date

Year	Allocation	Release	Difference (+/-)	Date of release
I	40.64	30.48	10.16	29/08/2014
II	9.29	-	-	N.A
III	9.57	-	-	N.A
Total	59.50	30.48	10.16	N.A