



**All India Coordinated Research Project On  
POST HARVEST ENGINEERING & TECHNOLOGY**

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**TEST REPORT OF PKV MINI DAL MILL  
(5 HP)**



For the purpose of testing the PKV mini dal mill (5 HP, Flat sieve unit) at M/s. Shri Ram Associates, Plot No. J-27, MIDC Phase III, Akola the inspection for specifications of the machine has been carried out on dated 27/12/2018, 03/01/2019 & 10/01/2019. The machine was found fabricated as per the drawing supplied by AICRP on Post Harvest Engineering & Technology, Dr. PDKV, Akola. The observations made on the prototype fabricated are as below.

The prototypes was tested on dated 27/12/2018, 03/01/2019 & 10/01/2019 for first, second and third pass with pigeon pea grain. A seasoned, cleaned and well graded pigeon pea grain and green gram sample each of 30 kg with initial moisture content of 10.4 % (w.b.) was used as sample for the trial. Following observations regarding the performance of the machine have been noted.

<b>Capacity, Kg/h</b>	
Pigeon pea	: 250 – 300 Kg/h
Green gram	: 300 – 350 Kg/h
<b>Product (dal) recovery, per cent</b>	
Pigeon pea	: 72 – 75 %
Green gram (mogar)	: 78-80 %

The quality of the grain, operator's skill and weather conditions are the major factors in the total percent recovery and it may vary by  $\pm 2$  to 5 %.

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## Dehulling Process

Pulses are dehulled particularly to improve their appearance, texture, cooking quality, palatability and digestibility. The split pulses are not affected by insect pests during storage but grains are much susceptible for their attack. Thus, dehulling of pulses are not only convenient for daily consumption but also increases the storage life.

### Pigeonpea

Pigeonpea grain is considered to be the most difficult-to-mill due to firm attachment of seed coat with cotyledons. It requires pretreatment for loosening of seed coat before dehulling. The steps involved in dry method are cleaning/grading, scarification, oil application, curing for some period, drying, partial dehulling, separation, and splitting. The dehulling operation should be done in such a way that it should result in the maximum pearled grain (gota) yielding maximum grade-I dal which fetches good price in the market. The whole process is enumerated. The wet method comprises of few operations like cleaning/grading, scarification, soaking in water for 30-45 min, drying and splitting.

### Grading

Since the physiological maturity of pigeonpea grains in the field does not occur at one time, contamination of small immature grain is unavoidable. Such grains, twigs, foreign matter, stones, dirt etc. can be eliminated by grading the raw grains before dehulling with the help of rotary cleaner-cum-grader-cum-polisher as described in forthcoming pages.

### Pretreatment

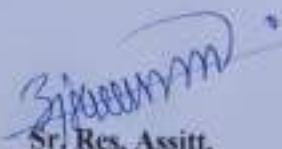
The well graded pigeonpea grain should be passed through the abressive roller, for scarification. During first and second pass apply oil approximately @ 125-150 g/q of grain. The pretreated grains can be dried after heaping for about 5-6 h under the sun for one or two days or using waste fired dryer with about 65°C drying air temperature for one or two hours.



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## Dehulling and separation

The pretreated and well dried grains should be passed through the abrasive roller with properly controlled feed rate. The optimum feed rate can be assessed by the observation of maximum dehulled grain coming out of the sieve unit outlet. During dehulling, the part of powder and husk is separated through the concentric sieve. From the dehulled produce while coming out of the roller, the remainder mixture of husk and powder is completely separated by means of a blower. The outlet of the blower is connected to the cyclone separator where the air is separated from the above mixture and the mixture is collected below. The mixture separated by concentric sieve is diverted to a separate outlet.

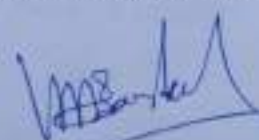
The remainder dehulled mixture falls on the sieve unit where it is divided in three parts viz. mixture of unhusked grain and *gota*, split *dal* and broken ( *churi*). The mixture of unhusked grains and *gota* should be treated with edible oil @ 125-150 g/q while passing through the mixer conveyer. It should be heaped for 10-12 h and then dried upto eight per cent moisture content. This dried mixture should be passed through the dehulling roller to get good quality split dal. The separated *gota* may be treated with water @ 8-10 lit/q, well dried and split to "Grade I" dal.

## Green/black gram

The well graded grains should be passed through the abrasive roller with proper flow rate adjustment to get complete scarification of grain. During passing through the conveyor, apply oil @125-150 g/q and water @ about 2 lit/q to the grain. The treated grain can be dried after heaping for about 10 to 12 h under the sun for one or two days or using drier with about 65°C during air temperature for one or two hours. This dried mixture should then be passed through the dehulling roller to get complete dehusked.

## Other pulses

Bengal gram requires moistening the grain slightly and dehulling without any special pretreatment. Soybean, masoor and cowpea grains can be dehulled without any treatment if the grain moisture content is 1



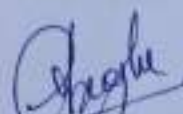
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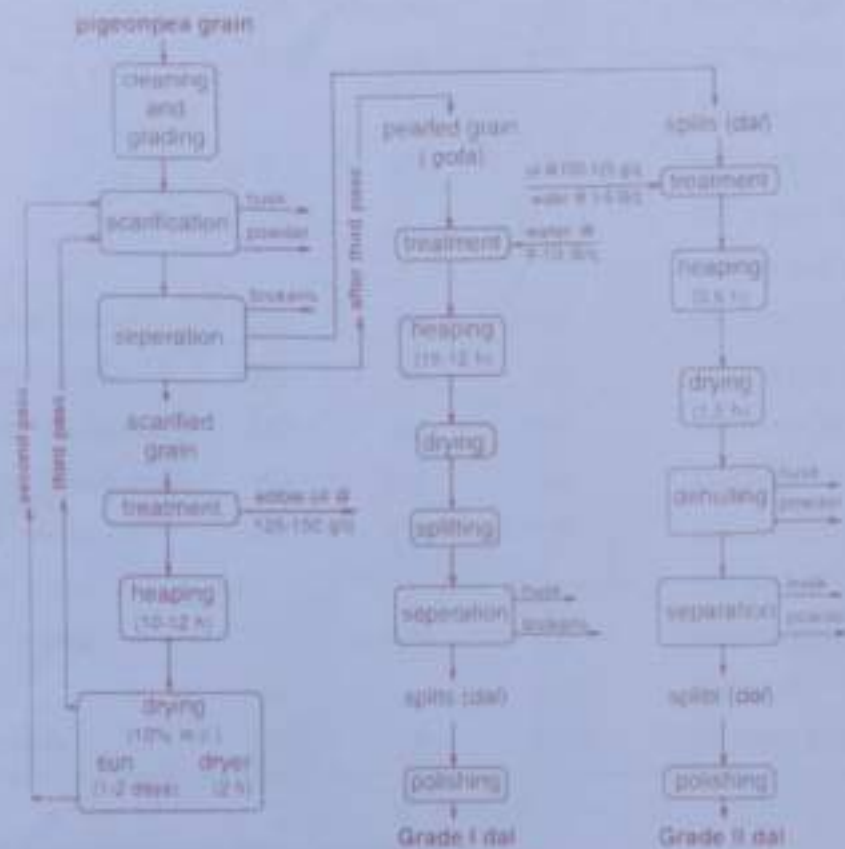
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**Process flow chart for pigeonpea dehulling (dry method) by  
PKV mini dal mill**



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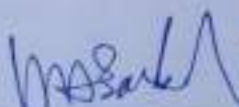


• Specifications of the machines (Overall dimensions, mm)

Particulars	Length	Width	Height	Materiel
Main Frame	1280	965	1240	MS Channel 75 x 40 x 6
Sieve Unit	1120	450	250	MS Sheet 18 Guage
Sieve size	000	000	---	MS sieve 20 Guage
Mixer conveyor	1600	130	150	MS Sheet 20 Guage & Side plate 16 Guage
Elevator	190	455	2870	MS Sheet 18 Guage MS Catori 76 x 76 Cotton belt 100 x 8
Feeding hopper (Roller)	465	465	240	MS Sheet 20 Guage
Feeding hopper (Splitter)	385	385	280	MS Sheet 20 Guage
Feeding hopper (Cleaning)	385	385	280	MS Sheet 20 Guage
Feeding hopper (Elevator)	565	565	610	MS Sheet 20 Guage
Roller outer casing (upper side)	730	430	270	MS sheet 20 Guage side plate 10 Guage MS round hole sieve 1.6mm $\Phi$
Roller outer casing (lower side)	730	430	380	
Oil & water tank	180	180	250	SS Sheet 24 Guage

• Power transmission system components

Name of Unit	Speed, RPM	Power received		Power given		V-belt No
		Shaft	Pulley Size, mm	Shaft	Pulley size, mm	
Counter shaft	540	Electric motor	76	Counter shaft	205	B 42
Dehulling unit	870	Electric motor	76	Dehulling unit	127	B 81
Blower	1800	Counter shaft	255	Blower shaft	76	B 83
Mixer conveyor	110	Counter shaft	63	Mixer Shaft	300	B 56
Splitter unit	900	Counter shaft	127	Splitter shaft	76	B 55
Elevator	112	Counter shaft	63	Elevator	300	B 80

  
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• Sieve sizes for separation of different grains / components

Name of grain	Upper sieve size, mm & No.	Lower sieve size, mm & No.
Pigeon pea	Min 2.70 x 20.00 (3.50 no.)	2.80 (9 no.)
	Max 3.10 x 20.00 (3.75 no.)	3.25 (10 no.)
Green / black gram	Min 2.40 x 20.00 (3.25 no.)	2.40 (8.5 no.)
	Max 2.70 x 20.00 (3.50 no.)	2.80 (9 no.)
Bengal gram	Min 3.95 x 20.00 (4.50 no.)	3.25 (10 no.)
	Max 5.00 x 20.00 (5.50 no.)	3.60 (10 no.)

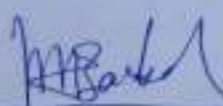
Note . These sieve sizes are given indicative / suggestive only. Proper sieve size will be determined by the grain size to be processed.


• Details of other parts


Name of Parts	Length/ Height size, mm	Diameter size, mm	Width size, mm	Material
Emery Roller	660	Left side - 230 Right side- 300	---	MS Sheet 18 Guage Side plate 10 Guage (Emery 18, 24 & 30)
Cyclone separator	520	305	---	MS Sheet 20 Guage
Blower	---	350	120	MS side plate & blade 16 Guage and Other 18 Guage
Splitter unit	---	395	145	MS side plate & blade 16 Guage and Other 18 Guage

• Shaft and Bearing sizes

Name of unit	Shaft size (Diameter)	Bearing size No.	No of bearing
Counter shaft	40 mm	P - 208	2
Dehulling unit	40 mm	P - 208	2
Blower	32 mm	P - 205	2
Mixer conveyor	32 mm	P - 205	2
Splitter unit	32 mm	P - 205	2
Sieve unit	20 mm	P - 204	8
Eccentric unit	---	p - 204	1
Elevator	32 mm	p - 206	4

  
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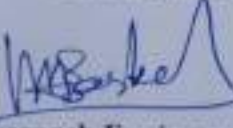


## • DO's


- ✓ Do keep the machines clean
- ✓ Do pay particular attention to lubrication.
- ✓ Do use spares from the manufacturer or dealer only.
- ✓ Do keep all the nuts and bolts tight.
- ✓ Do check proper tension for all the belts.
- ✓ Do keep the working space well ventilated.
- ✓ Do remove leaky cocks of oil and water container.
- ✓ Do check oil and water levels in storage container full.
- ✓ Do clean sieves periodically by slightly tapping it.
- ✓ Do check that the grains are dried to proper moisture level (8 to 10 per cent).
- ✓ Do drain oil and water at the end of days work and refill before starting for the next day.
- ✓ Do clear the grain from elevator boot before passing completely dehulled grain/gota.

## • Dont's

- × Don't unnecessarily interfere with any adjustments.
- × Don't forget to keep all the bolts well adjusted.
- × Don't subject the machines to continuous over loading.
- × Don't neglect faulty operation at any stage of the process.
- × Don't neglect any unusual sound produced by machine.
- × Don't neglect to fit the safe guards in places to avoid accidents.
- × Don't haste for more output from the machines because in case of more feed rate, the blower may leave some separated husk with dal, or there may be clogging of the dehulling unit.
- × Don't haste the drying operation because pigeonpea grain with higher moisture content than 10 per cent may not be dehulled completely.
- × Don't tap the sieve of dehulling machine heavily to avoid its tearing.
- × Don't forget to clean the machines at the end of day's work.
- × Don't hesitate to contact the dealer/manufacturer for additional information, if required.

  
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