

PROCESSING OF COTTON SEED AT SIMA CD & RA

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Cotton (*Gossypium spp.*) is considered as the **white gold** and king of fibre crops. It is one of the most important commercial crops playing a key role in economics, political and social affairs of the world. It contributes nearly one third of total foreign exchange earnings of India amounting to nearly 11.00 billion dollars (Mayee and Rao, 2002). Besides being a money spinner, it is also an employment generator as its cultivation provides 200 man-days ha⁻¹ of employment. The methods of seed processing play a major role in the cotton seed quality. Performance of different methods of processing with accuracy and efficiency will enhance the performance of cotton seed in the field.

Again, 'Seed Technology' is one of the major agricultural disciplines and includes areas such as seed production, seed resting, seed processing, treating, bagging, storage, transporting and marketing. It also includes seed certification, seed law and its enforcement.

Seed processing is a vital part of the total technology involved in making available high quality seed. It assures the end users, seeds of high quality with minimum adulteration. A good seed-processing job can assure that the previous efforts of seeds men in collecting seeds from the best places of seed production can result in maximum quality seed. If the seed is not processed and handled properly, all past efforts of seed collectors may be lost. In Agriculture, the term seed processing includes cleaning, drying, seed treatment, packaging and storage. Seed processing may be understood to 'comprise all the operations after harvest that aim at maximizing seed viability, vigour and health'.

Purposes of seed processing

- To lower the cost of further processing and storage including transport. This is achieved by reducing the bulk of the seed lot by cleaning debris and by removing empty or fractured seed (pre cleaning).
- To allow all the seeds to attain optimal maturity; by allowing 'after ripening' (pre curing)
- To free seeds from fruits structures; by extraction
- To increase the longevity of seeds; by drying seeds to safe moisture content and treating with protective chemicals.
- To reduce the variability in vigour by invigourating the seeds and removing the low vigour seeds.
- To improve the uniformity in seed shape or size by grading or by pelleting.



Following **steps are suggested** for efficient seed processing

- ❑ Raw cotton
- ❑ Ginning
- ❑ Delinting
- ❑ Gravity separation
- ❑ Seed packaging & labeling
- ❑ Pre-cleaning
- ❑ Fuzzy seed cleaning
- ❑ Fuzzy seed, Delinted seed cleaning and upgrading

Principles and Objectives

The quality of seed is improved during processing in two ways (1) separation of other crop seeds or inert matter and (2) upgrading or the elimination of poor quality seeds. The ultimate goal of seed processing is to obtain the maximum percentage of pure seed with maximum germination potential.

Harvest and post-harvest drying and processing

- Physiological and harvest maturity are two important aspects that lead to lot of variation in quality characteristics inclusive of seed sizes. Relative humidity and temperature come to play major physico chemical changes
- Relationship of seed moisture to seed injury during harvesting, cleaning, drying, grading and seed treating and the effect of seed injury on shelf life of seeds.
- Thoroughness of cleaning and grading and its relationship to storage life of seeds.

Seed Processing

Seed processing is an important as seed production in upgrading the seed quality ensuring 100% physically pure seeds, which will be free from varietal admixture and weed seeds. Seeds of various crops should be properly processed by employing various equipments such as prescaplers, air-screen cleaners cum graders, and such other sophisticated equipments as specific gravity separator and electronic colour separator assembled in proper sequence for different crops. The latter equipments are pressed into use for obtained seeds of **top grades** (sizes prescribed by certification) assuring high seed vigour and faster seedling growth, good stand/ field establishment and high yields by eliminating less dense seeds and off-coloured seeds from the seed lots.

Harvesting and Evaluation

Seed obtains harvestable maturity form 45-55 days after fertilization in different pickings. Bursted kapas should be picked periodically in six picking with an interval of a week. Retaining the kapas thus picked for more than a week reduces the seed quality.



First five pickings in winter season crop and first four pickings in the summer season crop alone should be taken for seed purpose because the seed from the subsequent pickings are inferior in quality. Seeds should not be collected from bolls, which are nearer to soil surface.

The cumulative percentage of recovery of seed from the first five pickings in winter and four pickings in summer is 90 and 80 respectively. The percentage of matured seed ranged from 72-93 in winter and 65-92 in summer season. The mean percentage of dormancy and duration are –

<u>Winter</u>			<u>Summer</u>	
<u>Extent</u>		<u>Duration</u>	<u>Extent</u>	<u>Duration</u>
MCU 5	12-21	20 days	28-70	30 days
MCU 6	15-27	„	29-83	„
MCU 7	11-19	„	19-70	„
MCU 8	17-32	„	26-72	„
MCU 9	17-36	„	41-97	„
Suvin	10-19	„	20-86	„
K 9	15-38	„	30-10	„

The kapas should be dried in shade immediately after each picking for a period of 3-5 days to reduce the moisture content to 15-17%, which is the optimum range for ginning with minimum injury to the seed. Air dry the seeds after ginning to cool the seeds. Then grade the seeds by sieving over a wire mesh sieve of 5 x 5. Faulty ginning causes injury to seed, which may go up to 6.5 per cent.

Ginning seed cotton

The ginneries engaged in cotton seed are normally evaluated for their performance and seed quality. The saw gin is found effective for ginning seed cotton (Kapas) as compared to roller gins. The results revealed that about 1 to 1.5% seed gets damaged on **saw gin** and 7 to 8% lint remain with seed compared to 3 to 4.5% seed damage obtained from **roller gin** and 12 to 14% lint remaining with seed (Chowdhury 1997). Ginning at 4.5 to 5.5 kg lint for 100 cm saw length per hour basis guarantees maximum quality level of seeds.

Fuzzy seed cleaning

Majority of the fuzzy cotton seed is manually screened and hand picked. The hand picking efficiency off a person is below 12 kg per day for hybrid cotton and 15 kg per day for improved cotton (Chowdhury, 1997). Attempt was made to modernize seed cleaning operation by introducing machine cleaning which were used to scalp out large size seed with lint for re-ginning, removal of light material and undersized seed. The rate of cleaning was 500 to 700 kg day⁻¹.



Delinting

For cotton seed, the seed lot enhancement consists of removing excess fibres, removing weak, immature and dead seeds, removing weed seeds and any other extraneous materials, applying chemical protectants and then packaging in the manner which can maintain quality during storage and be conveniently handled by the farmers. To enable easy flowing characteristics of the seed and also to upgrade seed quality, acid delinting is recommended and followed extensively by the farmers. However, to be precise with the dosage and duration of the treatment and its efficiency on storability pertinent to the species, lint intensity, and fuzziness relevant standardization experiments are necessary.

The cotton seeds obtained from ginneries contain about 8 to 10% of lint (fuzzy), which make them cline together during sowing. Delinting is a process by which the fuzzy is removed from the seed and becomes free flowing.

Advantages

- ❖ Delinted seed is free flowing, which makes easy for mechanical cleaning, upgrading, treating and packing.
- ❖ Delinting plant with high capacity could be established.
- ❖ Delinted seed makes precision planting easier.
- ❖ Delinting process disinfects seed coat, kills pinkworm larvae hibernating inside the seed there by no need for fumigation.
- ❖ Germination rate of delinted seed is enhanced by 2 to 3 days.
- ❖ Reduces the sowing seed rate.
- ❖ Uniform crop stand is established.
- ❖ Maintain high level of field emergence followed by better yield.
- ❖ Reduces volume of seed storage.
- ❖ Reduces the cost of seed treatment.

Delinting methods

- Mechanical delinting
- Dry Hydrochloric acid gas delinting
- Wet sulphuric acid delinting

Mechanical delinting

It is traditional processes of delinting using inter saws and is common in oil industries. It is not common among seed industries. Mechanical delinting is not suited for precision grading and to remove low-density seed as the linters do not get removed completely.

Wet acid delinting

The use of concentrated H_2SO_4 for delinting is common in humid area of India especially for hybrid cotton seed and is the simplest process. In this process concentrated H_2SO_4 (93 to 98% pure) is used. The ginned seed is treated with concentrated H_2SO_4 (100 ml kg^{-1} of fuzzy seed for 3-4 min.) and then washed with



water thoroughly and then by alkaline solution in order to remove the acid residues. The seed is again washed by sufficient water to remove the alkaline residues and then dried to 8 to 9% moisture content and then graded and packed.

Dry gas delinting

In the process of acid delinting huge quantities of water with acid is let out after several washings of the seed, in the open, which causes health hazards and environmental pollution. Hence an alternate method, dry gas delinting was evolved, which gained importance in the recent years. In dry gas delinting, dry HCl gas is injected in revolving drum containing fuzzy seed. The drum is heated by using burners so that seed temperature reaches to 49°C and hydrolysis takes place. The hydrolyzed lint gets broken in a scalper. Use of ammonia gas neutralizes the acid traces. The dry acid process is considered to be low cost by about 2 times than other methods.

Separation of dead seeds (cotton)

Stored fuzzy or delinted seeds and/or fresh seeds may be used to separate the dead seeds. Delinted seeds may be soaked in water for three hours, then air dried to original weight. Such seeds may be stirred in portable water. The “floaters” representing dead seeds become buoyant and may be removed. Sinkers represent good seeds.

Polymer coating of cotton seed

Seed coating is one of the most economical approaches for improving seed performance, which has been practiced as much as two thousand years ago. Polymer seed coating implies the use of a mixture of biodegradable polymer, plasticizer and colourants, which helps in improving the appearance, allowing even flow of seeds, dust free drilling and providing protection to the seeds.

Delinted seeds coated with polymer @ 3 ml kg⁻¹ along with water @ 10 ml kg⁻¹, DAP @ 40 g kg⁻¹ micronutrient mixture @ 3 g kg⁻¹, @ 2 g kg⁻¹ and deltamethrin @ 3 ml kg⁻¹ recorded the highest germination percentage as well as root length, shoot length, vigour index and dry matter production compared to fuzzy seeds. Coated delinted seeds showed advantage over uncoated delinted seeds.

Treated seeds can be stored in cloth bag/gunny bag for 24 months and in P-AF-P / polythene 700 gauge thick bags for 30 months. Both the moisture vapour proof bags should be heat sealed.

The production of seed decreases significantly with the period of storage of the seed material with which the seed crop was raised.

Emptiness

Emptiness and embryolessness have been reported for agri - and horti – seeds. Bt cotton, x-ray anatomical potential (contact therapy) may be useful to reveal failure in germination and vigour.



X – Radiography

This technique involves exposure of the seeds mostly to a voltage potential of 15 KV, with 2 mA current, at a distance of 25 cm for 3 seconds. This soft x-rays that pass through the seeds are differently absorbed depending upon the thickness of the tissue. Later, they strike a photographic film or florescent screen and form the object called radiograph and the technique is called ‘X-ray Contact Method’ (contact therapy – anatomical potential). This test reveals the internal structure of the seeds showing whether it is empty, filled insect infected or mechanically damaged.

Conclusion

The present day research and development has its own implication on the cotton production and productivity in India. Any successful seed production and post harvest handling programme envisages the production of high quality seeds, its processing and storage until it reaches the farmers for sowing.

REFERENCES

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