



THE EFFECT OF MECHANICAL AND CHEMICAL SCARIFICATION ON GERMINATION OF ARHAR SEEDS.

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ABSTRACT:

Five genotypes Arhar were sown during 2014. The seeds after harvesting, threshing and processing were evaluated for their hardseededness dormancy. The findings of the present study indicate that concentrated sulphuric acid, hot water, sand scarification and hot air oven methods are effective for reducing hardseededness in Arhar. All the above mentioned treatments showed injuries effect to the seed embryo by increasing the dead seeds and abnormal seedlings except concentrated sulphuric acid treatment. In general concentrated sulphuric acid treatment for 60 seconds have been found most effective for breaking seeds coat dormancy and also significantly highest germination percentage compared to the above mentioned treatments under taken in the present investigation.

Key words :- Arhar, dormancy, hard seed coat, germination.

INTRODUCTION.

Seeds dormancy is defined as the state in which seeds are prevented from germination even under favorable conditions for germination. The impermeability of seed coat to water is typical example of exogenibility are known as hard seeds. This impermeability may be due to the presence of a cuticle and a well developed layer of palisade cells or both. Cutin deposits have been reported by Thronton (1968). The development of hard seeds has been reported to be influenced both by genotypic and environmental factors (Puri and Laudlaw, 1984)

Most of the legume crop plants produce hard seeds to varying percentages. Most workers have found this trait to be highly heritable. However, the available literature does not clearly state the developmental stage in which the seed develops into hard seed. Hardseededness in Arhar creates problems in testing for germinability under laboratory conditions. Due to this state of affair there is great problem under field condition in securing uniform germination and good crop stand for maximum crop production. The present study was undertaken to evaluate the methods to overcome hardseededness in Arhar.

MATERIALS AND METHODS.

Five genotypes of Arhar viz. C-11, NO. 148, BDN – 2 Maroti and TAT-10 were used in the various phases of this study, produced in Kharif, 2014. Hard seeds which did not imbibe water were sorted out from the normal seeds which imbibe water. To evolve a quick method for breaking hardseededness in five genotypes of Arhar, the hard seeds were subjected to concentrated sulphuric acid (for 30 and 60 seconds), hot water (100°C for 120 and 180 seconds), sand scarification (100°C for 240 and 480 seconds) and air oven (140°C for 15 and 30 seconds)

For germination test in laboratory, the germination medium used was rolled towels paper under controlled conditions (i.e. temperature at $25 \pm 2^\circ\text{C}$ constant and relative humidity 85%), For acid treatment, seeds were soaked in concentrated sulphuric acid for the specified duration with constant stirrings (Dharmalingam et al. 1973), Seeds were thoroughly washed in running water after the acid treatment and the germination was tested in quadruplicate with 100 seeds in each replication. The germination count was taken on the 8th day and germination percentage was recorded on the basis of normal seedlings (ISTA, 1985)

RESULTS AND DISCUSSION

Arhar tested for different methods of breaking the hardseededness are presented in Table 1. The overall comparisons of mean among and within genotypes and treatments for both normal seedling and hard seed percentage showed that concentrated sulphuric acid for 60 seconds was the most effective treatment for reducing hard seeds content. It was followed by hot water for 180 seconds sand scarification for 480 seconds hot water 120 seconds, hot air oven 30 seconds, sand scarification 240 seconds, concentrated sulphuric acid of 30 seconds and hot air over 15 seconds. All the treatments showed injurious effect by increasing the abnormal seedling except concentrated sulphuric acid for 60 seconds. There is no germination in control (untreated) seeds Duran and Tortosa (1985) has clearly explained the effect of concentrated sulphuric acid on seed coat of *Sinapsis arvensis* and conclude that it was the rapid desiccation produced by concentrated sulphuric acid and not its hydrolytic capacity which seems to cause fragmentation of integuments and thus allowing the passage of water to the embryo. A similar mode of action can also be proposed for the shown as Arhar genotypes to the treatment with sulphuric acid.

CONCLUSIONS

The results obtained in the present investigation indicate that concentrated sulphuric acid treatment for 60 second has been found more effective for breaking hard seed coat dormancy in Arhar. The result confirms the finding of Charjan and Tarar (1990), Sing and Tomer (1993) and Cherian et al. (2011).

Effectiveness of concentrated sulphuric acid, hot water and hot air oven treatment for breaking hardseededness was also reported in related crops by Borikar et al. (1985), Radhakrishnan et al. (1989), Rana and Nautiyal. (1989), Tomer and Maguire. (1989), Verma and Singh. (1989), Charjan and Tarar. (1991), Singh and Tomer. (1993) and Cherian et al. (2011).

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Table 1 Effect of different treatments on Germinability of Arhar

S.N	Treatments	T-9			TAU-1			TAU-2			TPU-4			PKV-Udid-15		
		N	Ab	H	N	Ab	H	N	Ab	H	N	Ab	H	N	Ab	H
1	Control (Untreated hard seeds)	0	0	100	0	0	100	0	0	100	0	0	100	0	0	10
2	Concentrated sulphuric acid															
	(i) 30 seconds	80	24	16	88	3	9	80	9	11	80	6	14	83	6	11
	(ii) 60 seconds	92	4	4	95	4	1	90	10	0	95	4	1	91	6	3
3	Hot water treatment (100°C)															
	(i) 120 seconds	81	4	15	81	3	16	78	13	9	78	2	20	80	3	17
	(ii) 180 seconds	89	6	5	91	4	5	85	5	510	92	4	4	90	5	5
4	Sand Scarification (100°C)															
	(i) 240 seconds	75	5	20	78	5	17	74	12	14	70	3	27	76	6	18
	(ii) 480 seconds	85	5	10	90	4	6	86	10	4	90	5	5	88	3	9
5	Hot air oven (140°C)															
	(i) 15 seconds	84	7	9	75	5	20	68	14	18	75	4	21	70	5	25
	(ii) 30 seconds	82	6	8	87	7	6	80	14	6	87	3	10	86	4	10

N- Normal Seedlings, Ab- Abnormal seedlings, H- Hard seeds.