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Longevity of Dissipation of Seed Dormancy in Paddy varieties

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ABSTRACT: A study was conducted to study longevity of dissipation pattern of seed dormancy in 27 paddy varieties. Misinterpretation of germination results can lead to inaccurate conclusions about the viability and potential of plant seeds, affecting agricultural practices. Dormancy period and dissipation in paddy vary with the varieties BR-2655 (24 days), Thanu (3 days), IR-30864 (24 days), Jaya (30 days), Jyothi (48 days), Kadamba (36 days), IR-64 (21 days), MTU.1001 (21 days), MTU-1010 (9 days), Rasi (27 days), BPT 5204 (9 days), JGL 1798 (3 days), KCP-1 (45 days), Mandya Vijaya (9 days), Gangavathi sona (6 days), MAS 9461 (6 days), CTH-3 (24 days), Vikas (24 days), Mangala (18 days), Tella Hamsa (24 days), IR-20 (18 days), CTH-1 (21 days), KRH-2 (21 days), Thunga (30 days), KMR-3R (54 days), KMP-175 (12 days) and IET7575 (24 days) exhibited varied degree of seed dissipation periods. KMR-3R exhibited maximum dormancy period (54 days) and was least (3 days) in JGL 1798. Paddy hybrid KRH-2 and KRH-4 exhibited dormancy for 21 and 15 days respectively. This data could be utilized for seed certification during field inspection to inspect volunteer plant and seed testing to avoid misinterpretation of germination results.

Keywords: Dissipation, Seed Dormancy, Paddy, viability, longevity.

INTRODUCTION

Seed dormancy also evolved as a survival mechanism in annual plant species. Seed dormancy is an innate seed property that defines the environmental conditions in which the seed is able to germinate. Seed longevity is a central issue for both the conservation of biodiversity and for the success of crop production. When the vegetative and reproductive stages of the annual cycle of plant have been completed, the species survives as seed, the most resistant stage, until conditions again become favourable for start-up of the annual cycle (Gianinetti, 2007). While seed dormancy is of great adaptive significance for most plant species, it is one of the main reasons why grass species constitute the most serious weed problem in crops worldwide (Simpson, 1990).

Relatively intense and persistent dormancy only interferes with the timely sowing of crops and interpretation of testing results in seed testing laboratory. In addition, even a moderately persistent level of seed dormancy complicates and increases the difficulty of post-sowing operations like weeding and harvest, because of nonuniformity in emergence, plant growth and development. On the other hand, the absence of dormancy or a very low level of dormancy results to preharvest sprouting. This condition can occur where rice plants lodge into water or where there is frequent rain and high humidity during the maturation and harvesting period.

However, success in reducing dormancy to a level that permitted timely sowing as one of the great achievements in modern agriculture (Simpson,1990). In the past century, scientific plant breeders have successfully developed varieties with the most appropriate incidence and intensity of seed dormancy. Therefore, seeds of most modern rice varieties have a short dormancy period that persists until harvest maturity and a few days beyond, rather than no dormancy as frequently claimed by researchers comparing them with weedy rice. Seed dormancy intervenes with seed testing and crop production. Voluntary plants in seed production plots of paddy mainly influence by dormancy longevity. Thus, it is necessary to know the longevity of seed dormancy in different varieties which are under cultivation.

MATERIAL AND METHODS:

Twenty eight rice varieties which are under seed production chain (Table 1) are raised at Zonal Agricultural Research Station, VC Farm, Mandya during Kharif-2012 in Randomized Complete Block Design by following recommended package of practice. Seed were harvested at harvesting maturity stage and immediately seeds were dried to 12 per cent moisture.

Table 1: List of Paddy varieties used for longevity and dissipation of seed dormancy.

Sr. No.	Variety/hybrid	Institute released
1	KRH-4	University of Agricultural Sciences, Bangalore
2	Jaya	Professor Jayashankar Telangana State Agricultural University, Hyderabad
3	Jyothi	Kerala Agricultural University, Thrissur
4	Kadamba	University of Agricultural Sciences, Bangalore
5	IR-64	International Rice Research Institute, Philippines
6	MTU-1001	Acharya N.G. RANGA Agricultural University, Guntur
7	MTU-1010	Acharya N.G. RANGA Agricultural University, Guntur
8	Rasi	University of Agricultural Sciences, Bangalore
9	BPT- 5204	Acharya N.G. RANGA Agricultural University, Guntur
10	JGL- 1798	Professor Jayashankar Telangana State Agricultural University, Hyderabad
11	KCP-1	University of Agricultural Sciences, Bangalore
12	Mandya Vijaya	University of Agricultural Sciences, Bangalore
13	Gangavathi sona	University of Agricultural Sciences, Bangalore
14	MAS-9461	University of Agricultural Sciences, Bangalore
15	CTH-3	University of Agricultural Sciences, Bangalore
16	Vikas	University of Agricultural Sciences, Bangalore
17	Mangala	University of Agricultural Sciences, Bangalore
18	Tella Hamsa	Professor Jayashankar Telangana State Agricultural University, Hyderabad
19	IR-20	International Rice Research Institute, Philippines
20	CTH-1	University of Agricultural Sciences, Bangalore
21	KRH-2	University of Agricultural Sciences, Bangalore
22	Thunga	University of Agricultural Sciences, Bangalore
23	KMR-3R	University of Agricultural Sciences, Bangalore
24	KMP-175	University of Agricultural Sciences, Bangalore
25	IET-7575	University of Agricultural Sciences, Bangalore
26	BR-2655	University of Agricultural Sciences, Bangalore
27	Thanu	University of Agricultural Sciences, Bangalore

Once moisture reached 12 per cent seeds were stored in cloth bag in ambient conation.

Prior to seed germination test seeds were tested for seed viability test. The seed viability was confirmed by following 2,3,5-Triphenyl Tetrazolium Chloride (TTC) test using randomly selected 300 seeds of 100 seeds in each replications from the seed lot (Agrawal and Dadlani 1995). Seed were kept for germination in three days interval according to ISTA, 2006 till germination per cent equals viability per cent. Per cent germination was computed based on normal seedling basis.

The data was analysed statistically by following Completely Randomized Design (CRD) and adopting "Fischer's Analysis of Variance Technique" critical difference values were calculated at 5 per cent probability level (where "F" test was significant). Dunnett's "t" test was then performed to compare control with all other treatments (Panse and Sukhatme 1967).

RESULTS AND DISCUSSION

Varieties exhibited varied degree of seed dormancy and dissipation period of seed dormancy (Table 2, Fig. 1). KMR-3R exhibited maximum dormancy period (54 days) and was least (3 days) in JGL 1798. Difference among varieties is due to multiple loci and epistases controlled genetic variation (Gu *et al.*, 2004). Such difference in seeds dormancy also notice in many varieties and hybrids (Sukumara Dev, 1982; Ramegowda, 2003). Paddy hybrid KRH-2 and KRH-4 exhibited dormancy for 21 and 15 days respectively. Even though male parent of KRH-2 (KMR-3R) exhibited 54 days seed dormancy F1 exhibited only 21 days this is mainly due to maternal inheritance of the seed dormancy (Foley and Fennimore 1998).

Comparatively brown rice yielding Jyothi have more dormancy than other varieties (Except KMR-3R). This may be because of its brownness of grain as noticed by Wu 1978, Abscisic acid (ABA) is commonly assumed to be the primary effector of seed dormancy (Gianinetti, 2007), However it persist till seeds harvesting maturity later dormancy may due to many other factors may relate to the physiological state of endosperm and embryo (Takahashi, 1962), or relate to the influence of the pericarp (Seshu and Sorrells, 1986). Variation in seed dormancy has been reported in different varieties of *O. sativa* (Agarwal, 1981; Seshu, Chiranjeevi *et al.*, 2021 and Dadlani, 1991). This data could be utilized for seed certification during field inspection to inspect volunteer plant and seed testing to avoid misinterpretation of germination results.

Table 2: Seed germination and viability in paddy varieties over the period of time after the harvest indicating dissipation pattern of seed dormancy.

Sr. No.	Variety/ hybrid	Dormancy period (Days)																		
		3	6	9	12	15	18	21	24	27	30	36	39	42	45	48	51	54	57	60
1	KRH-4	32	46	51	66	81	96	96	96											
2	Jaya	4	9	9	23	25	56	71	77	78	82	91	91	91						
3	Jyothi	0	0	11	12	12	41	44	51	51	73	73	77	81	83	85	88	88	88	
4	Kadamba	2	4	6	6	28	31	55	76	76	79	81	90	90	90					
5	IR-64	52	55	61	76	82	84	84	86	86	86									
6	MTU-1001	22	44	51	71	86	86	87	88	88	88									
7	MTU-1010	61	66	78	91	91	91													
8	Rasi	13	25	41	53	59	61	79	81	83	90	90	90							
9	BPT- 5204	56	77	86	91	91	91													
10	JGL- 1798	88	91	91	91															
11	KCP-1	0	0	0	6	18	44	44	56	57	78	78	78	86	87	89	89	89		
12	Mandya Vijaya	55	67	89	91	91	91													
13	Gangavathi sona	56	76	88	88	88														
14	MAS-9461	36	67	86	86	86														
15	CTH-3	10	22	45	56	71	82	86	88	91	91	91								
16	Vikas	23	43	56	56	71	77	81	84	91	91	91								
17	Mangala	22	35	42	47	68	73	86	86	86										
18	Tella Hamsa	23	42	56	58	71	77	80	82	88	88	88								
19	IR-20	28	37	46	56	77	82	89	89	89	89									
20	CTH-1	7	18	28	51	66	81	88	92	92	92									
21	KRH-2	23	55	58	68	71	86	91	95	95	95									
22	Thunga	12	22	36	51	76	81	85	86	91	93	94	94	94						
23	KMR-3R	2	6	11	18	21	26	31	36	38	39	46	49	55	71	76	81	86	88	88
24	KMP-175	32	38	71	91	96	96	96												
25	IET-7575	12	27	36	51	66	71	78	86	91	91	91								
26	BR-2655	36	81	87	87	90	91	98	98	98										
27	Thanu	88	91	94	94	94														

*Stabilize germination values also indicates respective varietal viability

Further, correlation studies of dehusked seed colour with period of dormancy showed positive correlation. Varieties bearing brown colour/dull clour showed longer period of dormany (e.g., Jyothi and Athira) compared to pure white varieties.

This association was first reported for wheat (*Triticum aestivum* L.), where red grain genotypes were more dormant than the white ones, and this morphology has been used to select cultivars for resistance to pre-harvest sprouting (Johnson, 1935; Flintham, 2000). Further it was noticed in rice (Gu *et al.,* 2005; Gianinetti and Vernieri 2007, Gu *et al.,* 2011). Such positive correlation between brownness of grain also noticed by Wu 1978, he noticed 80% thiwan wild rice with brown pigmentation which is positively correlated with dormant period.

It was observed that period of dormancy was found to be associated with boldness of seed and period of seed dormancy. Most of the varieties which grouped under bold seed group (KMR-3R, Jaya, KCP-1, Thunga) were showed comparatively longer period of seed dormancy. Medium bold varieties showed medium period of seed dormancy. While, most of the fine grain varieties showed very low dormancy period (e g., Thanu, JGL-1979, Gangavathi Sana). There is a clear cut correlation between seed longevity and seed test weight. However, no such correlations are studied between seed test weight and dormancy period. The reason for this is obscure and needs further studies.

CONCLUSION

Seed dormancy of rice varieties at different intervals after harvest varied significantly. This data could be used for seed conditioning and seed release to market in paddy varieties.

FUTURE SCOPE

The knowledge obtained from the study can be translated into practical applications that benefit farmers, seed producers, and agricultural sustainability as a whole.

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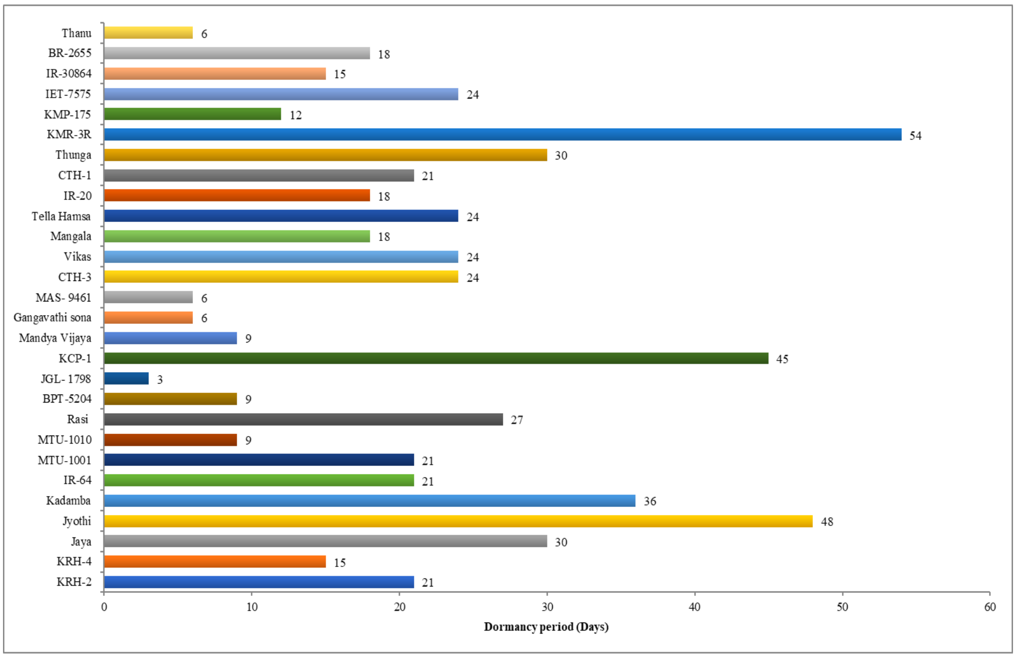

Fig. 1. Longevity and dissipation of seed dormancy in Paddy varieties.

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