COW URINE INCREASES THE LIFESPAN OF RICESEED *CV.* ADT 36 – AN ORGANIC APPROACH.

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Abstract

Storage experiments were carried out between June, 2012 and May 2013 using rice seedscv. ADT 36 treated with fresh cow urine concentrations *viz.,* 5, 10 and 100% by dipping and drying method and stored for a year in cloth bag along with untreated control.Seeds treated with 5% cow urine performed the best followed by 10% when assessed initially and throughout the storage period. Reduction in seed physiological parameters was also found to be lower when compared to remaining treatments. Cow urine at 100 % concentration (undiluted) was deleterious with seed coat discoloration (brown colour) observed after storage. Dipping and drying method for rice seeds in 5% cow urine concentration is recommended for initial vigor and short term storage (4 months).

Key words: Rice, cow urine, dipping and drying, seed storage, seed vigor.

Introduction

Rice is the staple diet for half the world's populationAs per the growing population, projected demand of rice is 94.5 Million Metric tons in 2011 and 102 Million Metric tons in 2026. (Indian Council for Research on International Economic Relations, 2008)The global demand for rice is slated to increase by 50% by 2050. We are, therefore, aiming at producing an additional 200 million tons of rice per year by 2030 (Zeigler, 2008).India was the world's largest rice exporter in 2012-13 at 10.9 million tons.

Indiscriminate use of agro-chemicals over 5-6 decades has adversely affected soil fertility, crop productivity, produce quality and particularly the environment (Choudharyet al., 2015). Soil organic carbon (SOC) content in most of Indian soils has been reduced to <0.5 per cent (14.139.94.101>fertimeter>FSCND42.aspx). Under these circumstances, maintenance of soil fertility and crop productivity are the major constraints in agriculture. Cow urine contains 1.21% N, very low P and 1.35% K (Singh *et al.* 2012).Cow urine a rich source potassium,is organic in nature, eco-friendly and available at free of cost. Approximately 2.4-2.5 KL of urine is produced per year per animal (Yawalkar*et al.,* 1996).

Soaking paddy seeds in diluted cow urine is recommended ecofriendly practice (Subhashini Sridhar et al., 2013). It is also considered as a natural disinfectant, pest repellent and forms the main component of Panchagavya (Subramanian, 2005 and Tharmaraj*et al.,* 2011). It has been known to promote germination of tamarind seeds (Sankaranarayanan et al., 1994) and improved maize yield upon seed priming (Manoj Kumar, 2014). In veterinary research, seed germination inhibition test by cow urine was used to detect the early pregnancy in cows. The degree of seed germination suppression was directly correlated with pregnancy period of cows (Nirmala*et al.,* 2008; RaoKrishna and Veena, 2009 andPerumal, 2014). Veena and Narendranath (1993) opined that pregnant cow urine had high concentration of Auxins and Abscisic acid. Standardization of optimum concentration of cow urine required to maintain initial seed vigourand during storage has not been attempted so far.

Materials and Methods

Seeds of rice variety ADT 36 with the initial germination percentage of 88 were used for the study. The storage experiment was carried out in the Department of Seed Science and Technology, Agricultural

College and Research Institute, Madurai, Tamil Nadu, using freshly collected cow urine (mixed breeds) from Central Farm of Agricultural College and Research Institute, Madurai between 7-9AM .The collected urine was allowed to reach ambient temperature and then diluted to concentrations of 5%, 10% (v/v) (by adding water) and as undiluted (100%). Fresh and vigorous seeds of rice variety ADT 36 seed samples were divided into five groups and subjected to dipping and drying technique (seeds were immersed in solutions and removed immediately) using diluted samples of cows urine, undiluted form and compared with water and untreated (dry) control. Immediately after dipping and three times stirring, the solutions were drained and seeds were dried into original moisture content (12%). The treated seeds were stored in cloth bags at ambient condition and the physiological observations were carried out at four months interval.

Seeds (four replicates of 100) wereplaced in sand filled trays and kept in germination room maintained at 25±2°C temperature and 95±3% RH. Speed of germination was calculated by counting the number of seeds germinated on each day, using Maguire (1962) formula. Germination percentage was calculated on the 14^{th} day.At the end of germination, ten normal seedlings were selected at random from each replication and used for measuring the root and shoot length of seedlings. These were assessedfor dry matter by drying in oven at 80°C for 12hrs. Vigor index values were computed using the following formula and the mean values were expressed in whole number (Abdul-Baki and Anderson, 1973). The data obtained from different experiments were analyzed by the 'F' test of significance using AGRES Statistical Package and normal data distribution was confirmed by SAS analysis.

Vigour index = Germination (%) x Dry matter production ($mg.seedling^{-1}$)

Results and Discussion

Germination percent and speed of germination of cv ADT 36 were significant due to treatments, period of storage and their interactions. The seeds dipped in cow urine 5% outperformed other treatments throughout the storage period in all physiological parameters studied followed by 10% treatment. Initially all treatments *viz.*, water, cow urine 5%, 10% and 100% performed better than untreated control recording germination percentage of 92, 91, 91, and 90 respectively compared to control (88%). The same trend was visible in speed of germination also (Fig. 1). Sivasubramaniamet al. (2012) reported that seeds biofortified with 5% cow urine improved the seed germination and vigour of green gram, cowpea and horse gram. Another investigation in paddy recorded significant improvement in plant height, number of effective tillers, filled grains, grain yield and straw yield with three sprays (maximum tillering, panicle initiation and flowering) using fresh cowurine(Singh et al.,2012).

Seeds treated with cowurine at 5% and 10% concentrations maintained Minimum Seed Certification Standards upto four months (88% and 80 % respectively), whereas, all other treatments recorded less than the prescribed standards (Fig. 1). After 12 months in storage cowurine (5%) treated seeds recorded maximum germination percentage and was three times higher than untreated control seeds (Fig.1).

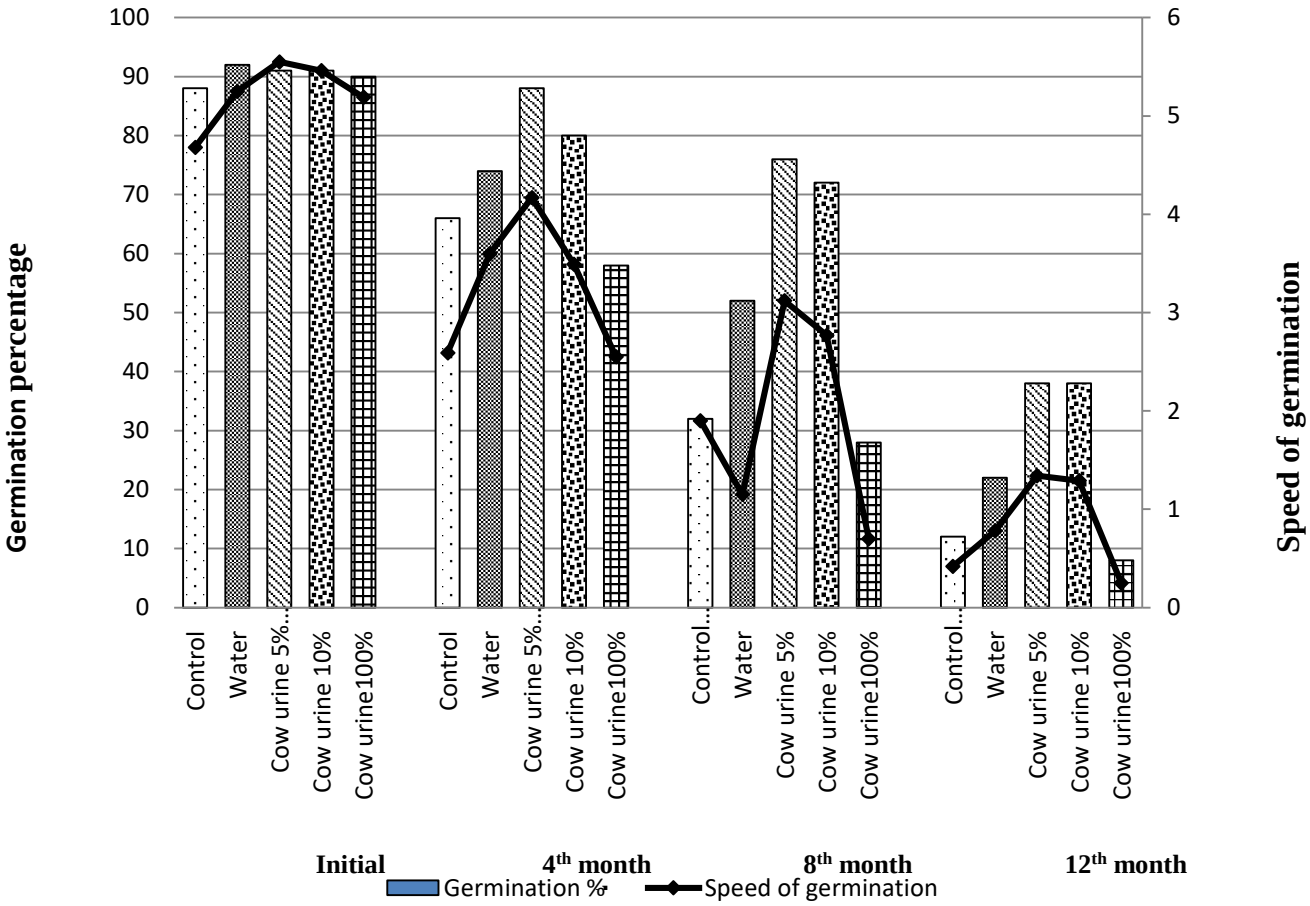

Fig 1. Effect of dipping and drying on germination percent and speed of germination of stored paddy seeds cv. ADT 36 using different concentrations of cow urine

Seedling length of 5% cow urine treated seeds was higher initially for treated seeds (19.4cm) and reduced to 18.54cm after a year compared to 18.91 and 14.26cm for control and 19.40 and 14.49cm in water soaking. Mean seedling length (19.91 cm), dry matter production (DMP) (142 mg) and vigour index (1195) were higher for 5% treated seeds and recorded 16.32%, 18.63% and 40.34% increase over untreated control. Significant seedling length (18.54 cm) was also recorded closely followed by 10% treatment (17.57cm) (Table 1). Seeds treated with undiluted cow urine (100%) though gave better results initially but failed to germinate upon storage.

Speed of germination

Fig 2. Seed coat discoloration caused by undiluted cow urine (100%) in one year stored paddy seeds cv. ADT 36 compared with control

Table 1.Effect of dipping and drying in different concentrations of cow urine on physiological parameters of stored paddy seeds cv. ADT 36

Treatment	Seedling length (cm)				Mean	DMP (mg. sdlgs^{-10})				Mean	Vigour Index [G % × DMP (mg. sdlgs^{-1})]				Mean
	Period of storage (months)					Period of storage (months)					Period of storage (months)				
	0	4	8	12		0	4	8	12		0	4	8	12	
Control	18.91	16.56	16.92	14.26	16.66	149.9	148.3	143.7	78.9	130.2	1319	979	460	95	713
Water	19.40	17.77	16.35	14.49	17.00	156.5	153.0	153.0	84.8	136.8	1440	1132	795	187	889
Cow urine 5%	21.84	20.13	19.12	18.54	19.91	171.4	165.4	161.2	142.0	160.0	1560	1456	1225	540	1195
Cow urine 10%	20.87	18.80	18.03	17.57	18.82	169.5	164.3	152.6	140.5	156.7	1542	1314	1098	534	1122
Cow urine 100%	20.30	16.16	13.85	0.00	12.58	161.9	158.1	68.6	0.0	97.2	1457	917	192	0	642
Mean	20.26	17.88	16.85	12.97	16.99	161.8	157.8	135.8	89.2	136.2	1464	1160	754	271	912
	T	P	T x P			T	P	T x P			T	P	T x P		
SEd	0.18	0.17	0.37			1.77	1.58	3.54			15.51	13.87	31.08		
CD (0.05)	0.37**	0.34**	0.75**			3.54**	3.17**	7.09**			31.02**	27.75**	62.04**		

As far as dry matter production (DMP) was concerned, the dry weight of ten seedlings from cowurine (5%) treated seeds recorded maximum of 142mg after one year of storage and the percentage of reduction from initial (171.4mg) was 17.15%, where as in control the percentage of reduction from initial (149.9mg) to final (78.9mg) observation was 47.37%. The seedling from seeds just dipped in water and dried, recorded 84.8mg initially and with 45.82% (156.5mg) after a year in storage. Slow reduction in vigour index (65.4%) was also observed in cow urine 5% treated seeds, where as in un treated control, the percentage reduction was 92.8% from initial (1319) to final month (95) compared to 87% reduction in water treated seeds (Table 1).

Cow urine is considered as a natural disinfectant and pest repellent (Subramanian, 2005 and Tharmaraj*et al.*, 2011). Seed priming using cow urine led to improved vigor and yield in maize (Manoj Kumar, 2014). In several veterinary experiments(Perumal, 2014; Rao Krishna and Veena,2009 and Nirmalaet al.,2008) conducted using cow urine, it was observed that continued exposure of seeds to cow urine led to deleterious effect on seed germination and vigor caused by the presence of increased concentration of hormones (Veena and Narendranath, 1993). But this experiment proved that short exposure (mere dipping and drying) of paddy seeds to diluted cow urine 5% can be stored well with minimum reduction of vigour loss upto four months. The reason for increased seed physiological parameters observed in the study may be due to the fact that bovine urine contains physiologically active substances like growth regulators, nutrients (Kamalam Joseph and Rajappan Nair, 1989). Significant plant height (74.21 cm), leaf dry weight and number of tillers (137.4) were recorded for wheat seeds soaked in 10% cow urine (Shivamurthy, 2005).

Use of undiluted cow urine (100%) caused deleterious effect in rice seeds when assessed after a year in storage as visualized by seed coat discoloration (Fig. 2). Hormone metabolites excreted through urine might have affected the seed germination at higher concentration (Nirmalaet al., 2008). A significant

inhibition of seed germination, shoot growth and discoloration of seeds were observed in pregnant cow urine (25%) treated wheat and green gram seeds (Rao Krishna and Veena, 2009).

Our experiment concluded that short exposure (dipping and drying) of rice seeds to diluted fresh cow urine (5%) followed by drying to original moisture content performed well in all seed physiological parameters initially and this treatment could be suggested as presowing treatment for energizing seeds. Such seeds can also be stored safely upto four months with no-visible loss in vigor. However even thoughseeds maintained seed germination which was three times greater than untreated control even after a year in storage, it was found to reduce the seed vigor. As a prestorage seed treatment it was also the easiest, quick, no-cost andeco-friendly technique that can be easily adopted by farmers for short term.

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