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Effect of Seed Coating with Synthetic Polymer and Seed Treatment Chemicals on Seed Quality and Storability of Maize Hybrid Byrava super (*Zea mays* L.)

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ABSTRACT: Maintenance of seed vigour and viability during storage is a matter of prime concern. Research on storability of hybrid maize in India is of recent origin. Freshly harvested hybrid maize Byrava super seeds were given five treatments *viz.* polymer coating, flowable thiram, polymer + flowable thiram, vitavax 200, polymer + vitavax 200 and control. Then the polymer-coated seeds were shade dried and packed in gunny bag and HDPE inter woven non-laminated bag and stored under ambient condition for eight months. Bimonthly observations on seed quality parameters were recorded. At the end of eight months of storage, seeds treated with polykote + vitavax 200 seeds recorded the lowest seed moisture content (13.58 %) with maximum germination (84 %), seedling length (26.64 cm), vigour index-I (2057), vigour index II (4100) and field emergence (80%). The seeds stored in HDPE inter woven bags recorded the least moisture content with highest germination (79 %), seedling length (25.71 cm), vigour index I (1987), vigour index II (3647) and field emergence (74 %) compared to gunny bag.The study concluded that maize hybrid byrava super seeds coated with polykote @ 3ml/kg + vitavax 200@ 2g/kg stored in HDPE inter woven bag maintained the highest seed quality parameters up to eight months of storage.

Key words: Seed coating, Synthetic polymer, Hybrid maize, Seed quality

Maize (*Zea mays* L.) is one of the most important cereals, both for human and animal consumption and is grown for grain and forage. It is known as the queen of cereals. In India, maize is grown in an area of 6.08 million hectares contributing 10.67 million tones of production with a productivity of 1760 kg/ha. In Karnataka , it is the third largest crop next to sorghum and paddy and it occupies an area of 4.98 lakh ha with an annual production of about 16.18 lakh tones and an average productivity of 3250kg/ha [1]. Maintenance of seed vigour and viability during storage is a matter of prime concern in India. Owing to the prevailing sub-tropical climate in the major parts of the country, seeds of most crop species show rapid deterioration and hybrid maize is no exception. In general, there are differences among species [2] and also among varieties within a species [3] with respect to loss of viability during storage of maize. Research on storability of hybrid maize in India is of recent origin. With the development of organized seed production and marketing system in India, stakeholders are becoming aware of the problems of seed storage and thereby systematic research has been initiated. It is estimated that 80 per cent of the certified seeds produced in India require storage for at least one planting season and 20 per cent of the seed is carried over for subsequent sowings [4]. However, when the awareness and infrastructure develops, substantial quantity of seeds may be stored for few planting seasons as a safeguard against monsoon failure and other natural calamities.

Seed quality is a multiple concept comprising several physical, chemical and biological components. Seed being a biological or living

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entity, deterioration in its quality is inevitable, irreversible and inexorable. It occurs with advance in ageing, which is common for all the living organisms. Seed deterioration is a phenomenon, which begins immediately after attaining physiological maturity even on the mother plant itself [5]. In order to prevent the qualitative losses due to several biotic and abiotic factors during storage and to add brand value and marketable value of seeds, several methods are being adopted such as seed treatment with chemicals, fungicides, polymer coating, polymer dyes and storing in safe containers such as cloth bag and polythene bag, besides sanitation of the storage place. The polymer coating with the negligible thickness of the seed coat provides protection from the imposed accelerated ageing, which includes fungal invasion. The polymer coating is simple to apply, diffuses rapidly and is non-toxic to the seed during germination. It reduces chemical wastage, helps to make room for including all required ingredients, protect seed from fungal invasion and insect attack. With this in view, the current research has been formulated to investigate the utility of polymer alone and in combination with other chemicals for improving the storability and seed quality in maize hybrid.

MATERIALS AND METHODS

Freshly harvested seed produce of maize hybrid Byrava super, produced from University of Agricultural Sciences, Dharwad, were dried to safe level of moisture (12%), graded to uniform size and used for the study. The seeds were treated with synthetic polymers *viz.*, T_1-untreated, T_2-polymer coating (polykote @ 3 ml/kg of seed diluted with 5 ml water), T_3-flowable thiram (Royal flow 40 SC) @ 2.4 ml/kg, T_4-polymer + flowable thiram, T_5-vitavax 200 @ 2g/kg of seed and T_6-polymer + vitavax 200. Then the polymer coated seeds were shade dried and packed in C_1-gunny bag and C_2-HDPE inter woven non-laminated bag, replicated thrice and stored under ambient condition at GKVK, Bangalore for a period of eight months, from June 2013 to February 2014. The seed samples were drawn at bimonthly intervals to study the seed quality attributes up to eight months of storage or till germination declined to less than Minimum Seed Certification Standards (MSCS). The following observations were recorded during storage *viz.*, Seed moisture content (%) was determined by hot air oven method, seed germination (%) test was conducted as per [6], seedling length (cm) was computed by adding both root and shoot lengths, seedling dry weight (mg) was recorded and seedling vigour indices-I & II were calculated as per formula given by [7]. SVI-I = Germination (%) x Mean seedling length and SVI-II = Germination (%) x Mean seedling dry weight (mg). Field emergence (%) was also recorded.

RESULTS AND DISCUSSION

Seed deterioration is an irreversible and inexorable process. However, the rate of seed deterioration could be slowed down either by storing the seeds under controlled conditions or by imposing certain treatments with either chemicals or any other protectants. Seed coating with polymers is one such pre-storage treatment that can be used either singly or in combination with other pesticides to protect seeds against pests and diseases. Studied have highlighted the possibilities of using polymers along with other chemicals to ensure the keeping quality of seeds [8]. The rapid deterioration of stored seed is a serious problem, particularly, in India where high temperature and relative humidity prevail and it is associated with accelerated ageing phenomenon. Since the controlled condition involves huge cost, the seed coating could be one of the best alternative approaches to maintain seed quality during storage. Polymer coating is a new concept in which the plasticizer polymer forms flexible film that adheres and protects the pesticide, thereby preventing wastage of the chemical. The film is readily soluble as it is hydrophilic and do not impede germination. Seed treatments *viz.*, flowable thiram and vitavax 200 might also have influenced the seed quality parameters due to phytotonic effect [9].

In the present investigation, irrespective of treatments, the initial seed quality parameters declined with the increase in storage period (Table 1). Amount of moisture in seeds is probably the most important factor influencing seed viability during storage (Table 2). Moisture content at the end of storage was 13.34%. The

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Table 1. Initial seed quality parameters of hybrid maize Byrava super

Seed quality parameters	Initial level
Seed moisture (%)	12
Germination (%)	97
Field emergence (%)	98
Mean seedling length (cm)	29.68
Mean dry weight (mg)	56.45
Vigour index-I	2878
Vigour index-II	5475

rate of deterioration increases as the moisture content of seed increases. The fluctuation in the moisture was higher in gunny bag. If the seed moisture is high, there will be fungal growth either within the seed or on the surface of seeds; further, even within the normal moisture range, the biological activity of seeds (and fungi) increases with the increase in temperature. In the present study, there was slight increase in the seed moisture over the storage period, irrespective of container and treatments. It did not fluctuate much over storage particularly in polymer-coated seeds stored in either gunny bag or HDPE inter woven non-laminated bag, mainly due the protection offered by these polymers, which prevented the absorption of moisture from storage environment [10]. Moisture content in seeds stored in HDPE inter woven non-laminated bag was within the safer limit (<13%) when compared to gunny bag (14%), at the end of storage. Therefore, the viability of seeds in gunny bag declined rapidly than the seeds stored in HDPE inter woven non-laminated bag.

Seed germination (%) had declined progressively over a period of storage irrespective of packaging material and seed coating polymers and chemicals. Among packaging materials, seeds stored in HDPE inter woven non-laminated bag recorded the highest germination (79 %) and lowest in gunny bag (77 %) at eight months of storage compared to initial seed germination (97 %). With respect to the treatments, Polykote @ 3ml/kg + vitavax 200@ 2g/kg seeds recorded highest germination percentage (84 %) compared to control (71 %). The decline in germination percentage may be attributed to ageing effect leading to depletion of food reserves and decline in synthetic activity of embryo apart from death of seed because of fungal invasion, fluctuating temperature, relative humidity and storage container in which seeds were stored. Germination (79%) was higher in HDPE inter woven non-laminated bags, which may be attributing to low rate of respiration compared to cloth bag. These findings are in agreement with the result obtained by [11] and [12] in cotton (Table 2).

Seedling length decreased gradually with advancement in storage period, however, at the end of eight months of storage, seeds stored in HDPE inter woven non-laminated bags recorded highest seedling length (25.71 cm) compared to cloth bag (25.52 cm). Among the treatments, polykote @ 3ml/kg + vitavax 200@ 2g/kg seed recorded the highest seedling length (26.64 cm) and lowest (23.31 cm) was in control, as against the initial data at the end of eight months of storage (Table.3). The damage caused by fungal infection and also production of toxic metabolites hindered the seedling growth. These findings are in agreement with the results obtained by [13] in rice [14] in cotton.

Seedling dry weight declined with advancement of storage period and at the end of storage period of eight months, there was no significant difference among the packaging materials. However, the highest seedlings dry weight (45.96 mg/seedling) was recorded in HDPE inter woven non-laminated bags, as compared to gunny bag (45.83 mg/seedling). The polykote @ 3ml/kg + vitavax 200@ 2g/kg seed recorded the highest seedling dry weight (49.10 mg/seedling) and lowest (38.58 mg/seedling) was in control (Table 3). Assessment of seedling vigour index is more relevant as the germination alone may not reveal the real potential of seed lots. The seedling vigour index based on seedling length is well correlated with seedling vigour index based on mean seedling dry weight at the end of eight months of storage. The seeds stored in HDPE inter woven non-laminated bags

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Table 2. Influence of synthetic polymer, chemical treatments and packaging materials on seed moisture content and germination (%) in hybrid maize Byrava super

Treatments	Seed moisture content (%)					Seed germination (%)				
	2 MAS	4 MAS	6 MAS	8 MAS	Mean	2 MAS	4 MAS	6 MAS	8 MAS	Mean
Packaging materials										
C_1	12.18	12.32	12.63	14.01	**12.79**	93	90	85	77	**86**
C_2	12.15	12.24	12.43	13.54	**12.59**	95	90	87	79	**88**
Mean	12.17	12.28	12.53	13.78		94	90	86	78	
SEm±	0.018	0.018	0.011	0.011		1.073	1.178	1.178	1.78	
CD (P=0.05)	0.051	0.051	0.031	0.031		3.06	3.36	3.36	5.09	
Seed coating polymer and chemicals										
T_1	12.18	12.34	12.61	13.90	**12.76**	93	90	86	71	**85**
T_2	12.16	12.55	12.54	13.91	**12.79**	93	90	86	73	**86**
T_3	12.18	12.29	12.55	13.79	**12.70**	94	91	86	80	**88**
T_4	12.18	12.28	12.51	13.77	**12.69**	94	89	85	80	**87**
T_5	12.18	12.33	12.57	13.73	**12.70**	92	88	85	80	**86**
T_6	12.13	12.20	12.43	13.58	**12.59**	94	92	88	84	**90**
Mean	12.17	12.33	12.54	13.78		93	90	86	78	
SEm±	0.031	0.020	0.020	0.020		1.858	2.041	2.041	2.041	
CD (P=0.05)	0.089	0.059	0.057	0.057		5.29	5.83	5.83	5.83	
Interaction (CxT)										
C_1xT_1	12.21	12.44	12.75	14.15	**12.89**	91	89	86	70	**84**
C_1xT_2	12.18	12.28	12.65	14.10	**12.80**	93	91	85	68	**84**
C_1xT_3	12.19	12.31	12.62	14.03	**12.79**	94	91	86	78	**87**
C_1xT_4	12.19	12.29	12.56	14.06	**12.78**	93	89	84	80	**87**
C_1xT_5	12.20	12.42	12.72	13.94	**12.82**	92	88	85	81	**87**
C_1xT_6	12.14	12.21	12.52	13.82	**12.67**	94	90	86	82	**88**
C_2xT_1	12.16	12.24	12.48	13.65	**12.63**	95	91	86	73	**86**
C_2xT_2	12.15	12.23	12.43	13.72	**12.63**	94	89	87	78	**87**
C_2xT_3	12.17	12.28	12.49	13.56	**12.63**	95	90	86	81	**88**
C_2xT_4	12.17	12.28	12.46	13.48	**12.60**	95	90	86	80	**88**
C_2xT_5	12.16	12.25	12.42	13.52	**12.59**	94	89	85	79	**87**
C_2xT_6	12.12	12.19	12.34	13.34	**12.50**	96	93	90	85	**91**
Mean	12.17	12.29	12.54	13.78		94	90	86	78	
SEm±	0.0445	0.028	0.029	0.028		2.628	2.886	2.886	2.886	
CD (P=0.05)	0.125	0.080	0.082	0.080		7.51	8.25	8.25	8.25	
CV	0.63	0.41	0.40	0.36		4.86	5.56	5.81	6.42	

MAS: months after storage, (a) packaging materials: C_1: Gunny bag, C_2: HDPE inter woven non-laminated bag (b) Seed coating polymer and chemicals: T_1-untreated, T_2-polymer coating (polykote @ 3 ml/kg of seed diluted with 5 ml water), T_3-flowable thiram (Royal flow 40 SC) @ 2.4 ml/kg, T_4-polymer + flowable thiram, T_5-vitavax 200 @ 2g/kg of seed and T_6-polymer + vitavax 200

recorded highest seedling vigour index-I (1987) and vigour index II (3647), whereas in the treatments polykote @ 3ml/kg + vitavax 200@ 2g/kg seed recorded highest vigour index I (2057) and II (4100), as compared to control (1668, 2758 respectively) (Table 4). These findings are in

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Table 3. Influence of synthetic polymer, chemical treatments and packaging materials on seedling length (cm) and seedling dry weight (%) in hybrid maize Byrava super

Treatments	Seedling length (cm)					Seedling dry weight (mg/seedling)				
	2 MAS	4 MAS	6 MAS	8 MAS	Mean	2 MAS	4 MAS	6 MAS	8 MAS	Mean
Packaging materials										
C_1	29.36	28.23	27.20	25.52	**27.58**	54.16	53.55	51.12	45.83	**51.17**
C_2	30.87	28.51	27.49	25.71	**28.15**	54.21	53.86	50.33	45.96	**51.09**
Mean	30.12	28.37	27.35	25.62		54.19	53.71	50.73	45.90	
SEm±	0.142	0.023	0.023	0.023		0.011	0.011	0.084	0.023	
CD (P=0.05)	0.405	0.065	0.065	0.065		0.031	0.031	0.240	0.065	
Seed coating polymer and chemicals										
T_1	29.03	27.52	26.62	23.31	**26.62**	53.86	53.25	45.10	38.58	**47.70**
T_2	29.70	27.86	27.15	24.80	**27.38**	53.83	53.30	49.23	45.24	**50.40**
T_3	30.11	28.45	27.60	25.99	**28.04**	54.41	53.84	51.09	46.98	**51.58**
T_4	30.67	28.57	27.50	26.43	**28.29**	54.38	53.98	52.62	47.22	**52.05**
T_5	30.23	28.60	27.65	26.54	**28.26**	54.10	54.07	53.01	48.25	**52.36**
T_6	30.94	29.21	27.57	26.64	**28.59**	54.54	53.80	53.31	49.10	**52.69**
Mean	30.11	28.37	27.35	25.62		54.19	53.71	50.73	45.90	
SEm±	0.246	0.040	0.040	0.040		0.020	0.020	0.146	0.040	
CD (P=0.05)	0.705	0.114	0.114	0.114		0.057	0.057	0.417	0.114	
Interaction (CxT)										
C_1xT_1	27.61	27.32	26.47	22.13	**25.88**	53.57	52.87	47.90	38.63	**48.24**
C_1xT_2	28.40	27.83	27.03	25.56	**27.21**	53.48	53.10	49.23	46.08	**50.47**
C_1xT_3	28.97	28.46	27.46	26.02	**27.73**	54.83	53.61	50.73	47.73	**51.73**
C_1xT_4	30.07	28.52	27.36	26.32	**28.07**	54.43	53.97	52.73	45.97	**51.78**
C_1xT_5	30.16	28.54	27.50	26.51	**28.18**	54.10	54.10	53.03	48.13	**52.34**
C_1xT_6	30.08	28.71	27.42	26.61	**28.21**	54.59	53.67	53.13	49.25	**52.66**
C_2xT_1	30.16	27.73	26.77	24.49	**27.29**	54.16	53.63	42.30	38.54	**47.16**
C_2xT_2	30.70	27.90	27.28	24.04	**27.48**	54.18	53.50	49.23	44.41	**50.33**
C_2xT_3	30.95	28.44	27.74	25.97	**28.28**	54.00	54.07	51.45	46.23	**51.44**
C_2xT_4	31.00	28.63	27.64	26.55	**28.46**	54.33	54.00	52.51	48.47	**52.33**
C_2xT_5	30.00	28.67	27.81	26.57	**28.26**	54.10	54.05	53.00	48.37	**52.38**
C_2xT_6	31.51	29.71	27.73	26.67	**28.91**	54.50	53.93	53.16	48.96	**52.64**
Mean	29.97	28.37	27.35	25.62		54.19	53.71	50.70	45.90	
SEm±	0.342	0.057	0.057	0.057		0.289	0.028	0.207	0.057	
CD (P=0.05)	0.978	0.163	0.163	0.163		0.826	0.080	0.592	0.163	
CV	1.98	0.35	0.37	0.39		0.09	0.09	0.71	0.22	

MAS: months after storage; (a) Packaging materials: C_1: Gunny bag, C_2: HDPE inter woven non-laminated bag; (b) Seed coating polymer and chemicals: T_1-untreated, T_2-polymer coating (polykote @ 3 ml/kg of seed diluted with 5 ml water), T_3-flowablethiram (Royal flow 40 SC) @ 2.4 ml/kg, T_4-polymer + flowablethiram, T_5-vitavax 200 @ 2g/kg of seed and T_6-polymer + vitavax200

agreement with the results obtained by [9] and [12] in cotton.

Field emergence decreased progressively with the advancement of storage period. At the end of eight months storage, the seeds stored in

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Table 4. Influence of synthetic polymer, chemical treatments and packaging materials on seedling vigour index-I and seedling vigour index-II in hybrid maize Byrava super

Treatments	Seedling vigour index-I					Seedling vigour index-II				
	2 MAS	4 MAS	6 MAS	8 MAS	Mean	2 MAS	4 MAS	6 MAS	8 MAS	Mean
Packaging materials										
C_1	2712	2531	2321	1958	**2381**	5028	4801	4362	3529	**4430**
C_2	2913	2576	2383	1987	**2465**	5135	4865	4358	3647	**4501**
Mean	2813	2554	2352	1973		5081.5	4833	4360	3588	
SEm±	23.57	23.67	23.57	50.61		22.90	23.78	23.58	23.57	
CD (P=0.05)	67.41	67.69	67.41	144.7		65.43	68.10	67.41	67.41	
Seed coating polymer and chemicals										
T_1	2689	2477	2289	1668	**2281**	5010	4792	3878	2758	**4110**
T_2	2763	2508	2335	1806	**2353**	5033	4797	4234	3298	**4341**
T_3	2831	2575	2374	2067	**2462**	5142	4872	4394	3734	**4536**
T_4	2871	2557	2337	2115	**2470**	5111	4831	4472	3778	**4548**
T_5	2797	2533	2351	2123	**2451**	5014	4785	4506	3860	**4541**
T_6	2926	2673	2427	2057	**2521**	5181	4922	4676	4100	**4720**
Mean	2813	2554	2352	1973		5082	4833	4360	3588	
SEm±	40.82	41.00	40.82	87.66		39.67	41.19	40.84	40.82	
CD (P=0.05)	116.7	119.3	116.7	250.2		113.4	117.8	116.8	116.7	
Interaction (CxT)										
C_1xT_1	2513	2431	2276	1549	**2192**	4875	4705	4119	2704	**4101**
C_1xT_2	2641	2533	2298	1738	**2303**	4974	4832	4185	3133	**4281**
C_1xT_3	2723	2590	2362	2030	**2426**	5154	4879	4363	3723	**4530**
C_1xT_4	2797	2538	2298	2106	**2435**	5062	4803	4429	3678	**4493**
C_1xT_5	2775	2512	2338	2147	**2443**	4977	4761	4508	3899	**4536**
C_1xT_6	2828	2584	2358	2182	**2488**	5131	4830	4569	4039	**4642**
C_2xT_1	2865	2523	2302	1788	**2370**	5145	4880	3638	2813	**4119**
C_2xT_2	2886	2483	2373	1875	**2404**	5093	4762	4283	3464	**4401**
C_2xT_3	2940	2560	2386	2104	**2498**	5130	4866	4425	3745	**4542**
C_2xT_4	2945	2577	2377	2124	**2506**	5161	4860	4516	3878	**4604**
C_2xT_5	2820	2552	2364	2099	**2459**	5085	4810	4505	3821	**4555**
C_2xT_6	3025	2763	2496	2267	**2638**	5232	5015	4784	4162	**4798**
Mean	2813	2554	2352	2001		5085	4834	4360	3588	
SEm±	57.73	57.98	57.73	123.9		56.10	58.26	57.75	57..73	
CD (P=0.05)	165.1	165.8	165.1	354.9		160.2	160.5	165.0	165.0	
CV	3.55	3.93	4.25	10.88		1.91	2.09	2.29	2.79	

MAS: months after storage, (a) Packaging materials: C_1: Gunny bag, C_2: HDPE inter woven non-laminated bag; (b) Seed coating polymer and chemicals: T_1-untreated, T_2-polymer coating (polykote @ 3 ml/kg of seed diluted with 5 ml water), T_3-flowablethiram (Royal flow 40 SC) @ 2.4 ml/kg, T_4-polymer + flowablethiram, T_5-vitavax 200 @ 2g/kg of seed and T_6- polymer + vitavax200

HDPE inter woven non-laminated bags recorded highest field emergence (74 %) compared to gunny bag (73 %). The polykote @ 3ml/kg + vitavax 200@ 2g/kg seed recorded the highest filed emergence (80 %) and lowest was in control (61 %). Further, field emergence declined in all

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Table 5. Influence of synthetic polymer, chemical treatments and packaging materials on field emergence (%) in hybrid maize Byrava super

Treatments	Field emergence (%)				
	2 MAS	4 MAS	6 MAS	8 MAS	Mean
Packaging materials					
C_1	93	90	82	73	**85**
C_2	93	91	83	74	**85**
Mean	93	91	83	74	
SEm±	1.14	1.17	1.17	1.17	
CD (P=0.05)	3.21	3.30	3.34	3.34	
Seed coating polymer and chemicals					
T_1	91	87	79	61	**80**
T_2	92	90	80	71	**83**
T_3	93	91	82	74	**85**
T_4	93	91	84	75	**86**
T_5	94	91	85	78	**87**
T_6	95	92	86	80	**88**
Mean	93	90	83	73	
SEm±	1.97	2.04	2.04	2.04	
CD (P=0.05)	5.63	5.83	5.83	5.83	
Interaction (CxT)					
C_1xT_1	90	87	79	63	**80**
C_1xT_2	92	89	80	69	**83**
C_1xT_3	94	90	82	74	**85**
C_1xT_4	93	90	83	74	**85**
C_1xT_5	94	90	85	78	**87**
C_1xT_6	95	92	86	80	**88**
C_2xT_1	92	88	80	64	**81**
C_2xT_2	92	90	81	72	**84**
C_2xT_3	93	91	83	74	**85**
C_2xT_4	93	92	85	76	**87**
C_2xT_5	94	91	86	78	**87**
C_2xT_6	95	92	87	80	**89**
Mean	93	90	83	74	
SEm±	2.79	2.88	2.88	2.88	
CD (P=0.05)	7.97	8.23	8.23	8.23	
CV	5.21	5.55	6.02	6.08	

MAS: months after storage (a) Packaging materials: C_1: Gunny bag, C_2: HDPE inter woven non-laminated bag, (b) Seed coating polymer and chemicals: T_1-untreated, T_2-polymer coating (polykote @ 3 ml/kg of seed diluted with 5 ml water), T_3-flowablethiram (Royal flow 40 SC) @ 2.4 ml/kg, T_4-polymer + flowablethiram, T_5-vitavax 200 @ 2g/kg of seed and T_6-polymer + vitavax200

the treatments as compared to initial field emergence (98 %) (Table 5). This decrease in field emergence may be due to age induced deteriorative changes in cell and cell organelles and germination capacity of seed under natural soil conditions. As field emergence and germination are positively correlated, the decline in field emergence may be attributed to decrease in germination per cent, seedling vigour, seed ageing and seed deterioration and loss of seed viability over a period of storage. Coating of polymer and chemicals avoid rapid water uptake and imbibition injury, resulting in rapid emergence from the soil. The coating also ensures protection of seeds from microorganisms and inturn helps in establishment of seedling in the field condition. These results are similar to the findings of [15] and [12] in cotton.

The study concluded that the maize hybrid byrava super seed coating with polykote @ 3ml/kg + vitavax 200@ 2g/kg of seeds and packed in HDPE inter woven non-laminated bags helps to maintain seed quality above minimum seed certification standards for more than eight months.

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