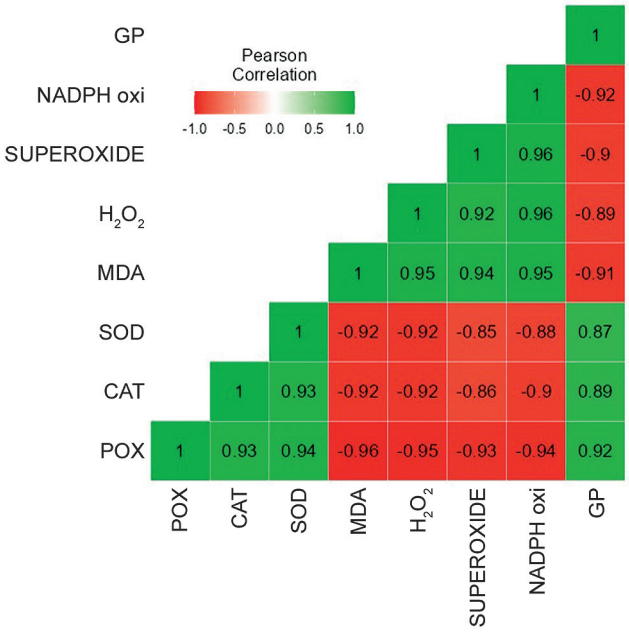

Supplementary Fig. 1 Correlation matrix of germination percentage (GP), NADPH oxidase (NADPH oxi), superoxide ($O_2^{\bullet-}$), hydrogen peroxide (H_2O_2), malondialdehyde (MDA), superoxide dismutase (SOD), catalase (CAT) and peroxidase (POX).

Supplementary Table 1 The average temperature (°C) and relative humidity (%) during months of seed storage (2022–23)

Month	T_{max} (°C)	T_{min} (°C)	T_{mean} (°C)	RH (%)
July, 2022	35.1	26.1	30.5	76.1
Aug., 2022	34.1	25.5	29.4	74.6
Sept., 2022	34.2	24.1	29.1	76.7
Oct., 2022	31.3	20.0	25.6	72.6
Nov., 2022	28.1	14.4	21.4	65.2
Dec., 2022	22.6	6.7	14.7	67.5
Jan., 2023	18.6	5.5	12.0	75.1
Feb., 2023	27.2	10.3	18.7	63.7
March, 2023	29.9	15.3	22.6	64.2
April, 2023	35.1	18.9	27.0	52.5
May, 2023	36.8	22.0	29.4	61.6
June, 2023	37.0	25.9	31.5	66.9
Mean	30.8	17.9	24.3	68.1

Supplementary Table 2 Effect of natural ageing on malondialdehyde content and superoxide dismutase activity in different genotypes

Malondialdehyde content (µmol/g FW)				Superoxide dismutase (Units/g FW)			
Ageing/ Genotype	0 month	6 months	12 months	Ageing/ Genotype	0 month	6 months	12 months
Sukhsagar	2.25^{b}	2.84^{b} (26)	3.14^{c} (40)	Sukhsagar	3.35^{ab}	2.48^{a} (26)	2.01^{a} (40)
POS 24K	2.42^{a}	3.38^{a} (39)	3.93^{a} (62)	POS 24K	3.30^{b}	2.01^{b} (39)	1.55^{b} (53)
Bhima Super	2.30^{ab}	2.83^{b} (23)	3.07^{c} (34)	Bhima Super	3.45^{ab}	2.34^{a} (32)	1.96^{a} (43)
Bhima Shubhra	2.20^{b}	3.25^{a} (48)	3.67^{b} (67)	Bhima Shubhra	3.48^{a}	1.91^{b} (45)	1.39^{b} (60)
CD (p<0.05) =	Ageing: 0.12	Genotype: 0.139	A×G: 0.241	CD (p<0.05) =	Ageing: 0.153	Genotype: 0.176	A×G: 0.306
SEM± =	Ageing: 0.041	Genotype: 0.047	A×G: 0.082	SEM± =	Ageing: 0.052	Genotype: 0.06	A×G: 0.104

Letters in superscript indicate significant differences at p<0.05 using the LSD tests; Values in parenthesis are percent change in values with ageing over fresh seeds (0 month); A×G, Ageing × Genotype.

Supplementary Table 3 Effect of natural ageing on catalase and peroxidase activity in different genotypes

Catalase activity (µmol/g FW/min)				Peroxidase activity (µmol/g FW/min)			
Ageing/ Genotype	0 month	6 months	12 months	Ageing/ Genotype	0 month	6 months	12 months
Sukhsagar	2.12^{ab}	1.61^{a} (24)	1.27^{a} (40)	Sukhsagar	0.70^{a}	0.53^{a} (26)	0.41^{b} (42)
POS 24K	2.02^{b}	1.27^{b} (37)	0.85^{b} (58)	POS 24K	0.65^{b}	0.39^{b} (40)	0.22^{d} (66)
Bhima Super	2.20^{a}	1.69^{a} (23)	1.18^{a} (46)	Bhima Super	0.74^{a}	0.53^{a} (28)	0.48^{a} (35)
Bhima Shubhra	2.12^{ab}	1.35^{b} (36)	0.76^{b} (64)	Bhima Shubhra	0.71^{a}	0.40^{b} (44)	0.29^{c} (59)
CD (p<0.05) =	Ageing: 0.148	Genotype: 0.171	A×G: 0.296	CD (p<0.05) =	Ageing: 0.034	Genotype: 0.039	A×G: 0.068
SEM± =	Ageing: 0.050	Genotype: 0.058	A×G: 0.101	SE ± (m) =	Ageing: 0.012	Genotype: 0.013	A×G: 0.023

Letters in superscript indicate significant differences at p<0.05 using the LSD tests; Values in parentheses are percent change in values with ageing over fresh seeds (0 month); A×G, Ageing × Genotype.

Supplementary Table 4 Component loading values for principal component analysis with varimax rotation

	Components		Uniqueness
	1	2	
CAT	0.995		0.00714
POX	0.981		0.06180
SOD	0.756	-0.444	0.23084
H_2O_2		0.996	0.00669
$O_2^{\bullet-}$	-0.853	0.425	0.09155
MDA	-0.502	0.864	0.00222
NADPH oxidase	-0.303	0.952	0.00212
Percent of Variance	72.38 %	22.75 %	