

Table 1. Weight of bread rolls before and after baking, and after storage. Moisture measured by air-oven method. Mean \pm SEM, n=3 independent samples per condition.

Time (h)	Storage	Genotype	Moisture (%)	Dough weight (g)	Baked roll weight (g)	Roll weight after storage (g)
0	Fresh	<i>sbell</i>	48.76 \pm 0.12	183.06 \pm 0.21	161.26 \pm 0.16	-
0	Fresh	WT	46.50 \pm 0.20	173.56 \pm 0.36	155.73 \pm 0.40	-
24	Freezer	<i>sbell</i>	48.74 \pm 0.13	183.13 \pm 0.14	160.20 \pm 0.39	160.13 \pm 0.41
24	Freezer	WT	46.55 \pm 0.16	173.73 \pm 0.28	156.03 \pm 0.49	156.03 \pm 0.49
24	Fridge	<i>sbell</i>	48.81 \pm 0.27	183.03 \pm 0.18	160.66 \pm 0.31	160.63 \pm 0.29
24	Fridge	WT	46.37 \pm 0.10	173.60 \pm 0.30	155.06 \pm 0.66	155.06 \pm 0.63
24	RT	<i>sbell</i>	48.52 \pm 0.10	183.13 \pm 0.18	161.40 \pm 0.20	161.30 \pm 0.29
24	RT	WT	46.42 \pm 0.05	173.70 \pm 0.20	156.06 \pm 0.12	155.90 \pm 0.29
48	Freezer	<i>sbell</i>	48.86 \pm 0.08	183.20 \pm 0.11	161.90 \pm 0.30	161.86 \pm 0.21
48	Freezer	WT	46.54 \pm 0.19	173.33 \pm 0.24	154.53 \pm 0.23	154.53 \pm 0.23
48	Fridge	<i>sbell</i>	48.68 \pm 0.02	183.20 \pm 0.15	161.23 \pm 0.64	161.23 \pm 0.58
48	Fridge	WT	46.17 \pm 0.39	173.50 \pm 0.28	154.73 \pm 0.46	154.73 \pm 0.41
48	RT	<i>sbell</i>	48.69 \pm 0.01	183.16 \pm 0.14	161.63 \pm 0.43	161.33 \pm 0.48
48	RT	WT	45.34 \pm 0.82	173.30 \pm 0.20	155.26 \pm 0.46	155.03 \pm 0.43
72	Freezer	<i>sbell</i>	49.01 \pm 0.00	183.03 \pm 0.31	160.80 \pm 0.55	160.70 \pm 0.55
72	Freezer	WT	47.49 \pm 1.34	174.16 \pm 0.29	155.70 \pm 0.70	155.70 \pm 0.70
72	Fridge	<i>sbell</i>	48.76 \pm 0.01	183.03 \pm 0.26	160.83 \pm 0.48	160.83 \pm 0.48
72	Fridge	WT	47.58 \pm 1.62	174.36 \pm 0.31	156.13 \pm 0.64	156.10 \pm 0.64
72	RT	<i>sbell</i>	48.74 \pm 0.04	182.96 \pm 0.29	161.63 \pm 0.35	161.36 \pm 0.32
72	RT	WT	46.30 \pm 0.66	174.10 \pm 0.47	156.10 \pm 0.92	155.80 \pm 0.92

Table 2. Starch susceptibility to amylolysis in bread. Estimated marginal means with 95% CI, $n = 3$ independent samples per condition.

Genotype	Storage	Time	C_{90} (%)	AUC (%min ⁻¹)	k (min ⁻¹)	C_{∞} (%)
<i>sbell</i>	Fresh	0h	51.7 [46.6; 56.9]	3581 [3336; 3826]	0.040 [0.028; 0.053]	54.2 [37.6; 70.8]
	RT	24h	60.3 [55.2; 65.5]	3482 [3237; 3727]	0.021 [0.008; 0.033]	69.9 [53.3; 86.5]
	RT	48h	53.3 [48.1; 58.4]	2805 [2560; 3050]	0.011 [-0.0004; 0.024]	84.1 [67.6; 100.7]
	RT	72h	60.4 [55.2; 65.6]	3060 [2815; 3305]	0.009 [-0.003; 0.021]	119.4 [102.8; 135.9]
	Freezer	24h	44.9 [39.8; 50.1]	2636 [2391; 2881]	0.019 [0.006; 0.031]	56.1 [39.6; 72.7]
	Freezer	48h	58.6 [53.4; 63.8]	3486 [3240; 3731]	0.020 [0.007; 0.032]	73.1 [56.5; 89.7]
	Freezer	72h	61.4 [56.3; 66.6]	3746 [3501; 3991]	0.025 [0.012; 0.037]	69.1 [52.5; 85.6]
	Fridge	24h	52.0 [46.8; 57.1]	3025 [2780; 3271]	0.020 [0.008; 0.033]	62.0 [45.4; 78.5]
	Fridge	48h	55.6 [50.4; 60.7]	3097 [2852; 3343]	0.019 [0.007; 0.032]	66.5 [49.9; 83.1]
	Fridge	72h	61.7 [56.6; 66.9]	3429 [3184; 3674]	0.018 [0.006; 0.031]	73.5 [57.0; 90.1]
WT	Fresh	0h	62.4 [57.2; 67.6]	4682 [4437; 4927]	0.083 [0.071; 0.095]	60.4 [43.9; 77.0]
	RT	24h	71.5 [65.1; 77.9]	4789 [4544; 5034]	0.043 [0.030; 0.055]	71.3 [54.7; 87.8]
	RT	48h	68.6 [63.5; 73.8]	3989 [3744; 4234]	0.017 [0.004; 0.029]	91.6 [75.0; 108.2]
	RT	72h	82.1 [76.9; 87.2]	4727 [4482; 4972]	0.015 [0.002; 0.027]	122.0 [105.5; 138.6]
	Freezer	24h	64.1 [59.0; 69.3]	4380 [4134; 4625]	0.039 [0.027; 0.052]	68.4 [51.8; 84.9]
	Freezer	48h	75.7 [70.5; 80.8]	5412 [5167; 5657]	0.049 [0.037; 0.062]	77.2 [60.7; 93.8]
	Freezer	72h	78.6 [73.5; 83.8]	5521 [5276; 5767]	0.070 [0.058; 0.083]	75.2 [58.7; 91.8]
	Fridge	24h	63.0 [57.9; 68.2]	4359 [4114; 4605]	0.043 [0.030; 0.055]	64.7 [48.2; 81.3]
	Fridge	48h	71.6 [66.4; 76.7]	4773 [4527; 5018]	0.045 [0.033; 0.057]	70.6 [54.0; 87.2]
	Fridge	72h	78.5 [73.4; 83.7]	5253 [5008; 5498]	0.039 [0.026; 0.051]	80.7 [64.1; 97.3]

Table 3. Texture analysis measurements, Estimated marginal means with 95% CI, n = 3 independent samples per condition (4 technical replicates)

Storage Condition	Storage duration	Genotype	Response	SE	df	lower.CL	upper.CL	Texture measure
Fresh	0h	WT	305.8183	26.939	40	223.961	417.5942	Hardness
Fresh	0h	<i>sbell</i>	373.4318	32.895	40	273.4767	509.9203	Hardness
Freezer	24h	WT	581.705	51.241	40	426.0021	794.3169	Hardness
Freezer	24h	<i>sbell</i>	642.7244	56.616	40	470.6887	877.6388	Hardness
Fridge	24h	WT	1164.528	102.58	40	852.8233	1590.161	Hardness
Fridge	24h	<i>sbell</i>	936.6819	82.51	40	685.9637	1279.037	Hardness
RT	24h	WT	783.4469	69.012	40	573.7445	1069.795	Hardness
RT	24h	<i>sbell</i>	616.8406	54.336	40	451.7332	842.2945	Hardness
Freezer	48h	WT	556.6381	48.742	39	408.1547	759.1387	Hardness
Freezer	48h	<i>sbell</i>	600.6628	52.911	40	439.8856	820.2038	Hardness
Fridge	48h	WT	1207.639	106.38	40	884.3946	1649.028	Hardness
Fridge	48h	<i>sbell</i>	965.9951	85.092	40	707.4307	1319.064	Hardness
RT	48h	WT	992.0864	87.391	40	726.5382	1354.692	Hardness
RT	48h	<i>sbell</i>	729.762	64.283	40	534.4292	996.4884	Hardness
Freezer	72h	WT	736.7416	64.898	40	539.5406	1006.019	Hardness
Freezer	72h	<i>sbell</i>	679.0834	59.819	40	497.3156	927.2869	Hardness
Fridge	72h	WT	1860.303	163.87	40	1362.362	2540.239	Hardness
Fridge	72h	<i>sbell</i>	1141.099	100.52	40	835.665	1558.168	Hardness
RT	72h	WT	1326.348	116.84	40	971.329	1811.125	Hardness
RT	72h	<i>sbell</i>	878.3376	77.371	40	643.2362	1199.368	Hardness
Fresh	0h	WT	0.906002	0.0365	40	0.785811	1.044576	Cohesiveness
Fresh	0h	<i>sbell</i>	0.859134	0.0346	40	0.74516	0.99054	Cohesiveness
Freezer	24h	WT	0.816017	0.0329	40	0.707763	0.940828	Cohesiveness
Freezer	24h	<i>sbell</i>	0.736312	0.0296	40	0.638632	0.848932	Cohesiveness
Fridge	24h	WT	0.697355	0.0281	40	0.604843	0.804016	Cohesiveness
Fridge	24h	<i>sbell</i>	0.7163	0.0288	40	0.621275	0.825859	Cohesiveness
RT	24h	WT	0.779263	0.0314	40	0.675885	0.898453	Cohesiveness
RT	24h	<i>sbell</i>	0.732887	0.0295	40	0.635662	0.844984	Cohesiveness

Freezer	48h	WT	0.82841	0.0324	35	0.720284	0.952768	Cohesiveness
Freezer	48h	<i>sbell</i>	0.745085	0.03	40	0.646242	0.859048	Cohesiveness
Fridge	48h	WT	0.665942	0.0268	40	0.577598	0.7678	Cohesiveness
Fridge	48h	<i>sbell</i>	0.677572	0.0273	40	0.587684	0.781208	Cohesiveness
RT	48h	WT	0.697285	0.0281	40	0.604783	0.803937	Cohesiveness
RT	48h	<i>sbell</i>	0.665358	0.0268	40	0.577091	0.767126	Cohesiveness
Freezer	72h	WT	0.801086	0.0323	40	0.694813	0.923614	Cohesiveness
Freezer	72h	<i>sbell</i>	0.734578	0.0296	40	0.637128	0.846933	Cohesiveness
Fridge	72h	WT	0.585278	0.0236	40	0.507635	0.674798	Cohesiveness
Fridge	72h	<i>sbell</i>	0.549974	0.0221	40	0.477014	0.634093	Cohesiveness
RT	72h	WT	0.668668	0.0269	40	0.579962	0.770942	Cohesiveness
RT	72h	<i>sbell</i>	0.676337	0.0272	40	0.586614	0.779784	Cohesiveness
Fresh	0h	WT	733.626	68.894	40	526.3783	1022.472	Cohesiveness
Fresh	0h	<i>sbell</i>	515.8861	48.447	40	370.1494	719.0027	Cohesiveness
Freezer	24h	WT	543.2563	51.017	40	389.7876	757.1492	Cohesiveness
Freezer	24h	<i>sbell</i>	468.7169	44.017	40	336.3055	653.2619	Cohesiveness
Fridge	24h	WT	809.168	75.988	40	580.5799	1127.757	Cohesiveness
Fridge	24h	<i>sbell</i>	729.0972	68.469	40	523.1289	1016.16	Cohesiveness
RT	24h	WT	609.2306	57.212	40	437.1243	849.0992	Cohesiveness
RT	24h	<i>sbell</i>	554.4715	52.07	40	397.8346	772.7801	Cohesiveness
Freezer	48h	WT	524.144	47.791	35	378.3489	726.1204	Cohesiveness
Freezer	48h	<i>sbell</i>	457.1171	42.928	40	327.9825	637.0949	Cohesiveness
Fridge	48h	WT	807.6437	75.845	40	579.4862	1125.632	Cohesiveness
Fridge	48h	<i>sbell</i>	681.4935	63.999	40	488.9731	949.8137	Cohesiveness
RT	48h	WT	690.9314	64.885	40	495.7449	962.9676	Cohesiveness
RT	48h	<i>sbell</i>	601.9149	56.525	40	431.8753	838.9032	Cohesiveness
Freezer	72h	WT	593.2733	55.714	40	425.6749	826.8591	Cohesiveness
Freezer	72h	<i>sbell</i>	503.3437	47.269	40	361.1502	701.5221	Cohesiveness
Fridge	72h	WT	1088.233	102.2	40	780.8099	1516.697	Cohesiveness
Fridge	72h	<i>sbell</i>	634.5509	59.59	40	455.2917	884.3887	Cohesiveness
RT	72h	WT	888.9669	83.482	40	637.8358	1238.974	Cohesiveness

RT	72h	<i>sbell</i>	593.9452	55.777	40	426.1571	827.7956	Cohesiveness
Fresh	0h	WT	0.642881	0.0144	40	0.593882	0.695922	Cohesiveness
Fresh	0h	<i>sbell</i>	0.626407	0.014	40	0.578664	0.67809	Cohesiveness
Freezer	24h	WT	0.577142	0.0129	40	0.533153	0.62476	Cohesiveness
Freezer	24h	<i>sbell</i>	0.523458	0.0117	40	0.483561	0.566647	Cohesiveness
Fridge	24h	WT	0.471252	0.0106	40	0.435334	0.510133	Cohesiveness
Fridge	24h	<i>sbell</i>	0.519163	0.0116	40	0.479593	0.561997	Cohesiveness
RT	24h	WT	0.544125	0.0122	40	0.502653	0.589019	Cohesiveness
RT	24h	<i>sbell</i>	0.552746	0.0124	40	0.510617	0.598351	Cohesiveness
Freezer	48h	WT	0.581027	0.0129	38	0.537069	0.628583	Cohesiveness
Freezer	48h	<i>sbell</i>	0.492143	0.011	40	0.454633	0.532747	Cohesiveness
Fridge	48h	WT	0.435805	0.0098	40	0.402589	0.471762	Cohesiveness
Fridge	48h	<i>sbell</i>	0.469281	0.0105	40	0.433513	0.507999	Cohesiveness
RT	48h	WT	0.489392	0.011	40	0.452092	0.52977	Cohesiveness
RT	48h	<i>sbell</i>	0.505461	0.0113	40	0.466936	0.547165	Cohesiveness
Freezer	72h	WT	0.551776	0.0124	40	0.509721	0.597301	Cohesiveness
Freezer	72h	<i>sbell</i>	0.481038	0.0108	40	0.444374	0.520726	Cohesiveness
Fridge	72h	WT	0.37733	0.0085	40	0.348571	0.408462	Cohesiveness
Fridge	72h	<i>sbell</i>	0.474302	0.0106	40	0.438152	0.513435	Cohesiveness
RT	72h	WT	0.450442	0.0101	40	0.416111	0.487607	Cohesiveness
RT	72h	<i>sbell</i>	0.487987	0.0109	40	0.450794	0.528249	Cohesiveness
Fresh	0h	WT	277.0349	26.774	40	196.8383	389.9055	Chewiness
Fresh	0h	<i>sbell</i>	320.864	31.01	40	227.9797	451.5915	Chewiness
Freezer	24h	WT	474.6306	45.87	40	337.2337	668.0064	Chewiness
Freezer	24h	<i>sbell</i>	473.1832	45.73	40	336.2052	665.9692	Chewiness
Fridge	24h	WT	812.071	78.482	40	576.9911	1142.928	Chewiness
Fridge	24h	<i>sbell</i>	670.8578	64.834	40	476.6566	944.1811	Chewiness
RT	24h	WT	610.4644	58.998	40	433.746	859.1821	Chewiness
RT	24h	<i>sbell</i>	452.1936	43.702	40	321.2917	636.4279	Chewiness
Freezer	48h	WT	460.4346	44.102	39	327.8144	646.7075	Chewiness
Freezer	48h	<i>sbell</i>	447.477	43.246	40	317.9405	629.7897	Chewiness

Fridge	48h	WT	804.2747	77.728	40	571.4518	1131.955	Chewiness
Fridge	48h	<i>sbell</i>	654.5011	63.254	40	465.0349	921.1603	Chewiness
RT	48h	WT	691.7454	66.853	40	491.4977	973.5789	Chewiness
RT	48h	<i>sbell</i>	485.5551	46.926	40	344.9957	683.3818	Chewiness
Freezer	72h	WT	590.1039	57.03	40	419.2795	830.5262	Chewiness
Freezer	72h	<i>sbell</i>	498.8946	48.215	40	354.4737	702.1561	Chewiness
Fridge	72h	WT	1088.795	105.23	40	773.6088	1532.396	Chewiness
Fridge	72h	<i>sbell</i>	627.5834	60.652	40	445.9094	883.2757	Chewiness
RT	72h	WT	886.9733	85.721	40	630.2106	1248.347	Chewiness
RT	72h	<i>sbell</i>	594.0192	57.408	40	422.0614	836.0366	Chewiness
Fresh	0h	WT	2.90255	0.2297	42	2.195948	3.836519	Resilience
Fresh	0h	<i>sbell</i>	1.397544	0.1155	50	1.048093	1.863508	Resilience
Freezer	24h	WT	1.144744	0.0888	39	0.869596	1.506951	Resilience
Freezer	24h	<i>sbell</i>	0.99051	0.0768	39	0.752434	1.303916	Resilience
Fridge	24h	WT	0.996651	0.0773	39	0.757098	1.312	Resilience
Fridge	24h	<i>sbell</i>	1.086795	0.0843	39	0.825576	1.430666	Resilience
RT	24h	WT	0.998034	0.0774	39	0.758149	1.31382	Resilience
RT	24h	<i>sbell</i>	1.016732	0.0822	45	0.765937	1.349645	Resilience
Freezer	48h	WT	1.137755	0.087	37	0.866478	1.493963	Resilience
Freezer	48h	<i>sbell</i>	1.021416	0.0792	39	0.775911	1.344601	Resilience
Fridge	48h	WT	1.004173	0.0779	39	0.762812	1.321902	Resilience
Fridge	48h	<i>sbell</i>	1.041348	0.0808	39	0.791052	1.370839	Resilience
RT	48h	WT	0.998964	0.0775	39	0.758856	1.315045	Resilience
RT	48h	<i>sbell</i>	1.027492	0.0831	45	0.774043	1.363928	Resilience
Freezer	72h	WT	1.005527	0.078	39	0.763841	1.323684	Resilience
Freezer	72h	<i>sbell</i>	1.00899	0.0783	39	0.766471	1.328243	Resilience
Fridge	72h	WT	0.999493	0.0775	39	0.759257	1.315741	Resilience
Fridge	72h	<i>sbell</i>	1.011149	0.0784	39	0.768111	1.331085	Resilience
RT	72h	WT	1.002361	0.0777	39	0.761436	1.319517	Resilience
RT	72h	<i>sbell</i>	0.999844	0.0775	39	0.759524	1.316203	Resilience
Fresh	0h	WT	277.0349	26.774	40	196.8383	389.9055	Gumminess

Fresh	0h	<i>sbell</i>	320.864	31.01	40	227.9797	451.5915	Gumminess
Freezer	24h	WT	474.6306	45.87	40	337.2337	668.0064	Gumminess
Freezer	24h	<i>sbell</i>	473.1832	45.73	40	336.2052	665.9692	Gumminess
Fridge	24h	WT	812.071	78.482	40	576.9911	1142.928	Gumminess
Fridge	24h	<i>sbell</i>	670.8578	64.834	40	476.6566	944.1811	Gumminess
RT	24h	WT	610.4644	58.998	40	433.746	859.1821	Gumminess
RT	24h	<i>sbell</i>	452.1936	43.702	40	321.2917	636.4279	Gumminess
Freezer	48h	WT	460.4346	44.102	39	327.8144	646.7075	Gumminess
Freezer	48h	<i>sbell</i>	447.477	43.246	40	317.9405	629.7897	Gumminess
Fridge	48h	WT	804.2747	77.728	40	571.4518	1131.955	Gumminess
Fridge	48h	<i>sbell</i>	654.5011	63.254	40	465.0349	921.1603	Gumminess
RT	48h	WT	691.7454	66.853	40	491.4977	973.5789	Gumminess
RT	48h	<i>sbell</i>	485.5551	46.926	40	344.9957	683.3818	Gumminess
Freezer	72h	WT	590.1039	57.03	40	419.2795	830.5262	Gumminess
Freezer	72h	<i>sbell</i>	498.8946	48.215	40	354.4737	702.1561	Gumminess
Fridge	72h	WT	1088.795	105.23	40	773.6088	1532.396	Gumminess
Fridge	72h	<i>sbell</i>	627.5834	60.652	40	445.9094	883.2757	Gumminess
RT	72h	WT	886.9733	85.721	40	630.2106	1248.347	Gumminess
RT	72h	<i>sbell</i>	594.0192	57.408	40	422.0614	836.0366	Gumminess
Fresh	0h	WT	2.90255	0.2297	42	2.195948	3.836519	Springiness
Fresh	0h	<i>sbell</i>	1.397544	0.1155	50	1.048093	1.863508	Springiness
Freezer	24h	WT	1.144744	0.0888	39	0.869596	1.506951	Springiness
Freezer	24h	<i>sbell</i>	0.99051	0.0768	39	0.752434	1.303916	Springiness
Fridge	24h	WT	0.996651	0.0773	39	0.757098	1.312	Springiness
Fridge	24h	<i>sbell</i>	1.086795	0.0843	39	0.825576	1.430666	Springiness
RT	24h	WT	0.998034	0.0774	39	0.758149	1.31382	Springiness
RT	24h	<i>sbell</i>	1.016732	0.0822	45	0.765937	1.349645	Springiness
Freezer	48h	WT	1.137755	0.087	37	0.866478	1.493963	Springiness
Freezer	48h	<i>sbell</i>	1.021416	0.0792	39	0.775911	1.344601	Springiness
Fridge	48h	WT	1.004173	0.0779	39	0.762812	1.321902	Springiness
Fridge	48h	<i>sbell</i>	1.041348	0.0808	39	0.791052	1.370839	Springiness

RT	48h	WT	0.998964	0.0775	39	0.758856	1.315045	Springiness
RT	48h	<i>sbell</i>	1.027492	0.0831	45	0.774043	1.363928	Springiness
Freezer	72h	WT	1.005527	0.078	39	0.763841	1.323684	Springiness
Freezer	72h	<i>sbell</i>	1.00899	0.0783	39	0.766471	1.328243	Springiness
Fridge	72h	WT	0.999493	0.0775	39	0.759257	1.315741	Springiness
Fridge	72h	<i>sbell</i>	1.011149	0.0784	39	0.768111	1.331085	Springiness
RT	72h	WT	1.002361	0.0777	39	0.761436	1.319517	Springiness
RT	72h	<i>sbell</i>	0.999844	0.0775	39	0.759524	1.316203	Springiness

Table 4. Proportion of chain length distribution per DP fraction. Data is reported as Mean \pm SD of $n = 3$, p -value obtained from independent samples t -test between *sbell* and WT control starch

Genotype	WT	<i>sbell</i>	p -value
0-12 DP	25.1 \pm 2.7	14.1 \pm 2.2	0.005
12-25 DP	27.3 \pm 1.5	17.5 \pm 1.9	0.002
25-37 DP	10.8 \pm 0.3	9.6 \pm 0.9	0.13
37-100 DP	10.9 \pm 0.7	19.0 \pm 0.3	0.0006
100-1600 DP	15.8 \pm 2.7	26.3 \pm 3.4	0.01
>1600 DP	10.1 \pm 1.2	13.5 \pm 1.7	0.05

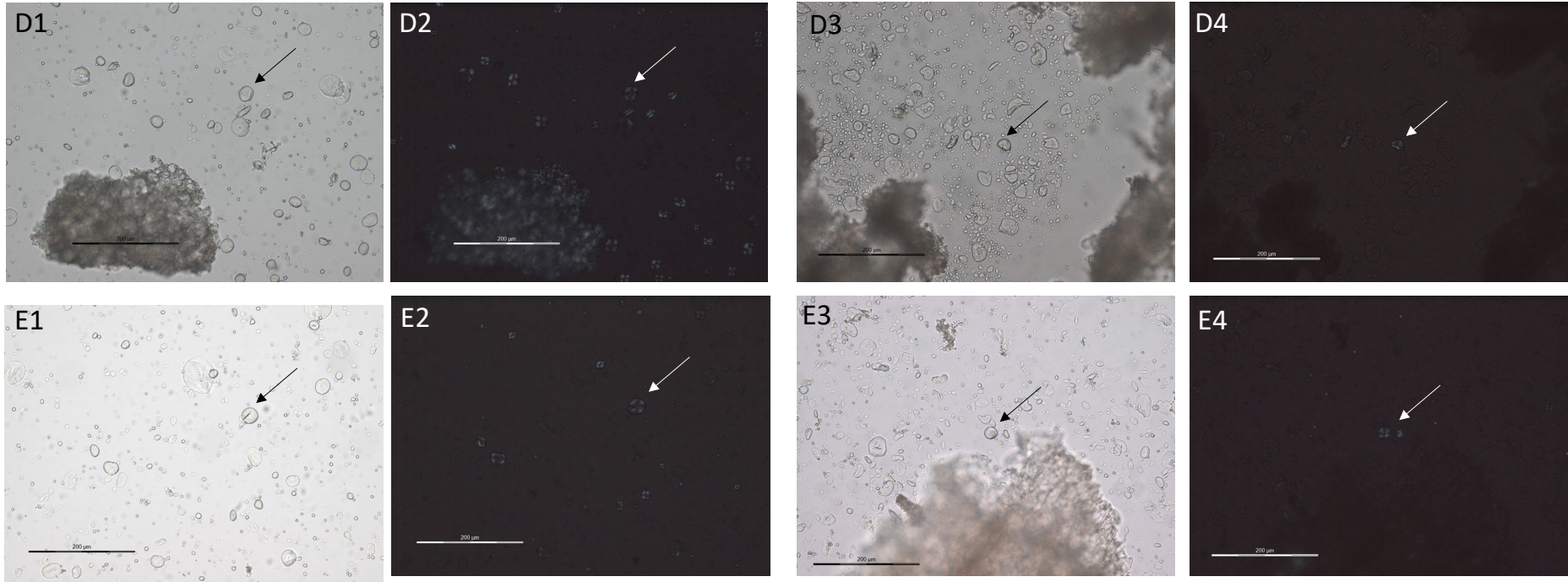


Figure 2 Micrographs of starch in water using brightfield (BF) and polarised light filter (P) highlighting birefringence of starch granules. 1. WT control starch under BF; 2. WT control starch under P; 3. sbell mutant starch under BF; 4. sbell mutant starch under P; D. Starch from fresh bread crust; E: Starch from frozen crust after 7 days of freezer storage.