

Effect of Nitrogen Nutrition and Planting Date on the Yield and Physicochemical Parameters of Flowering Chinese Cabbage

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Supplementary Materials

Table S1. SD values for content of N, P, K, Ca and Mg in leaves (% in d.m.).

N level	N		P		K		Ca		Mg	
	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
Substrate										
N-50	0.310	0.229	0.026	0.021	0.026	0.297	0.252	0.433	0.252	0.033
N-70	0.319	0.125	0.037	0.057	0.037	0.412	0.333	0.156	0.333	0.037
N-90	0.398	0.200	0.053	0.048	0.053	0.385	0.124	0.253	0.124	0.023
N-110	0.144	0.511	0.042	0.041	0.042	0.515	0.198	0.240	0.198	0.041
N-130	0.111	0.322	0.020	0.032	0.020	0.318	0.308	0.227	0.308	0.029
Hydroponic										
N-50	0.231	0.144	0.025	0.017	0.025	0.359	0.127	0.181	0.127	0.045
N-70	0.400	0.066	0.010	0.018	0.010	0.529	0.234	0.295	0.234	0.055
N-90	0.151	0.144	0.043	0.008	0.043	0.762	0.139	0.315	0.139	0.081
N-110	0.401	0.087	0.029	0.040	0.029	0.398	0.102	0.130	0.102	0.083
N-130	0.644	0.087	0.024	0.033	0.024	0.578	0.429	0.166	0.429	0.036

Table S2. SD values for content of Fe, Zn, Mn, Cu (in mg·kg⁻¹ d.m.) and Na (% in d.m.) in leaves.

N level	Fe		Zn		Mn		Cu		Na	
	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
Substrate										
N-50	22.557	17.414	5.662	7.379	7.165	9.260	1.798	1.212	0.020	0.025
N-70	20.314	28.508	1.809	3.207	1.426	2.601	1.889	0.304	0.028	0.017
N-90	16.142	3.719	6.164	4.001	4.355	4.596	0.459	0.480	0.016	0.033
N-110	4.564	22.521	4.687	5.699	3.368	3.672	1.621	0.632	0.038	0.042
N-130	21.781	32.274	2.684	2.046	2.580	3.411	0.493	0.411	0.041	0.052
Hydroponic										
N-50	4.153	7.753	0.270	0.040	4.759	2.876	0.243	0.258	0.012	0.037
N-70	5.092	9.655	1.537	0.381	5.057	2.485	0.242	0.497	0.005	0.008
N-90	2.568	10.272	4.650	0.730	2.655	3.728	0.223	0.136	0.024	0.023
N-110	4.857	3.735	3.137	1.669	2.372	3.855	0.160	0.129	0.017	0.006
N-130	9.930	8.507	3.160	2.374	5.888	9.512	0.572	0.324	0.018	0.019

Table S3. SD values for color parameters.

N level	L* (D65)		a* (D65) green		b* (D65) yellow		h* [°](D65)		C*	
	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
Substrate										
N-50	0.006	0.010	0.006	0.010	0.012	0.015	0.015	0.020	0.010	0.017
N-70	0.006	0.000	0.006	0.006	0.015	0.010	0.012	0.023	0.014	0.008
N-90	0.000	0.006	0.006	0.006	0.020	0.015	0.006	0.026	0.020	0.012
N-110	0.006	0.006	0.006	0.012	0.015	0.012	0.010	0.015	0.014	0.015
N-130	0.032	0.006	0.006	0.006	0.015	0.012	0.010	0.006	0.016	0.013
Hydroponic										
N-50	0.006	0.006	0.006	0.000	0.012	0.006	0.025	0.006	0.012	0.005
N-70	0.006	0.000	0.006	0.006	0.017	0.015	0.031	0.020	0.014	0.014
N-90	0.000	0.000	0.020	0.006	0.012	0.006	0.040	0.020	0.018	0.007
N-110	0.010	0.006	0.017	0.006	0.012	0.010	0.023	0.010	0.017	0.011
N-130	0.006	0.010	0.012	0.006	0.012	0.006	0.035	0.029	0.006	0.005

Table S4. SD values for chlorophylls and carotenoids.

N level	Chl a (mg/g DW)		Chl b (mg/g DW)		Carotenoid (x+c) (mg/g DW)		Chl a+Chl b (mg/g DW)		Chl a/Chl b		(Chl a+Chl b)/(x+c)	
	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
Substrate												
N-50	1.027	0.900	0.505	0.501	0.184	0.201	1.529	1.335	0.755	0.805	0.646	0.884
N-70	0.625	0.200	0.215	0.066	0.155	0.086	0.835	0.261	0.129	0.063	0.099	0.314
N-90	0.486	0.387	0.101	0.116	0.278	0.059	0.571	0.490	0.131	0.119	0.736	0.267
N-110	0.550	0.797	0.228	0.350	0.139	0.186	0.773	1.034	0.183	0.779	0.234	1.010
N-130	1.092	0.158	0.073	0.227	0.309	0.149	1.133	0.214	0.424	0.787	0.278	0.927
Hydroponic												
N-50	0.947	0.305	0.300	0.149	0.281	0.055	1.247	0.399	0.104	0.319	0.287	0.068
N-70	0.229	0.478	0.066	0.308	0.055	0.131	0.274	0.611	0.099	0.895	0.019	0.668
N-90	1.054	0.246	0.146	0.153	0.288	0.063	1.199	0.399	0.217	0.208	0.297	0.013
N-110	0.618	0.558	0.325	0.425	0.159	0.036	0.939	0.981	0.254	0.735	0.092	0.847
N-130	0.878	0.724	0.091	0.335	0.098	0.203	0.879	0.918	0.390	0.852	0.361	0.706

Table S5. SD values for phenolic content and the antioxidant activity.

N level	TEAC ($\mu\text{mol/g}$)		DPPH ($\mu\text{mol TE/g}$)		FRAP (mmol TE/g)		TPC (mg GAE/g)		TFC (mg QE/g)	
	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn	Spring	Autumn
Substrate										
N-50	6.086	8.381	17.202	8.695	1.598	1.625	0.494	0.668	0.381	0.048
N-70	18.399	4.493	5.322	3.281	2.399	0.226	0.841	0.050	0.306	0.025
N-90	10.234	13.221	6.880	10.475	0.618	1.206	1.047	0.741	0.360	0.128
N-110	10.234	12.574	22.838	6.941	3.378	2.229	0.470	0.041	0.142	0.030
N-130	2.703	10.981	5.493	8.695	1.409	1.016	0.488	0.678	0.355	0.210
Hydroponic										
N-50	53.176	25.312	2.743	0.857	7.680	0.016	1.298	0.371	0.198	0.046
N-70	25.998	32.031	0.000	9.031	0.152	1.004	0.381	0.720	0.147	0.123
N-90	29.251	9.524	12.668	2.250	4.864	1.622	0.249	0.394	0.199	0.108
N-110	16.729	7.797	10.621	14.267	2.192	1.747	0.295	0.567	0.135	0.059
N-130	31.562	21.355	5.485	3.577	5.929	2.372	0.191	0.526	0.271	0.142

Table S6. r-Pearson's coefficients for the correlation between variables for substrate samples (as an average over season). L*—lightness, a*, b*—colour chromatic coordinates, h*—hue angle, C*—chroma.

Variables	N	P	K	Ca	Mg	Na	Fe	Zn	Mn	Cu	TEAC	DPPH	FRAP	TPC	TFC	L* (D65)	a* (D65)	b* (D65)	C*	h* (D65)	Chl a	Chl b	Carot-enoids (x+c)	Chl a+ Chl b	Chl a/ Chl b	(Chl a+ Chl b)/ (x+c)
N	1	.1568	.8453	.6203	-.7319	.7821	.4389	.2036	.6565	-.5216	.3937	-.4705	-.5357	-.4661	-.7019	.1622	.4090	-.8049	-.7931	.2411	-.2478	-.1761	-.4228	-.2371	-.1521	.6132
P		1	.2566	-.1058	.1179	-.1448	-.1191	.1023	-.0082	-.0511	-.3353	.0733	.0994	-.0029	.1106	-.5526	.3343	.0281	-.0373	-.3993	.1965	.1773	.2108	.1960	.0980	-.1324
K			1	.4816	-.8460	.7015	.2768	-.1848	.4814	-.7089	.0652	-.7011	-.7738	-.7527	-.7335	.2195	.6643	-.7483	-.7905	-.0816	-.5261	-.4213	-.6395	-.5133	-.1886	.5780
Ca				1	-.3404	.6441	.4098	.1147	.5181	-.3132	.5046	-.3811	-.3960	-.3726	-.4900	.4278	.0003	-.5032	-.4480	.4434	-.1762	-.0571	-.2971	-.1541	-.2417	.4695
Mg					1	-.6672	-.2483	.2599	-.3738	.6928	-.1327	.7847	.8728	.7708	.7693	-.4159	-.5615	.7422	.7653	-.0326	.6976	.6115	.8039	.6919	.1644	-.6141
Na						1	.3930	.0732	.5744	-.4179	.4962	-.4553	-.5365	-.4683	-.6064	.2960	.2650	-.7851	-.7486	.3906	-.3073	-.2082	-.4676	-.2918	-.2246	.6165
Fe							1	.2681	.3176	-.1737	.3628	-.2690	-.2600	-.1516	-.3426	.0088	.2792	-.3936	-.4061	.0273	-.1696	-.1942	-.2379	-.1778	.0489	.2356
Zn								1	.4175	.2837	.4798	.4266	.4298	.4694	.1877	-.3614	-.2657	.0049	.0531	.2635	.5200	.4760	.4203	.5200	.0418	.0202
Mn									1	-.3309	.4925	-.2193	-.2647	-.1539	-.3197	-.0107	.1775	-.5564	-.5292	.2774	.0215	.0198	-.1246	.0215	-.0474	.3925
Cu										1	.0329	.6224	.6676	.6019	.6826	-.2999	-.5087	.5039	.5435	.1188	.3869	.2881	.5051	.3729	.1584	-.4835
TEAC											1	.1333	.0532	.0866	-.1146	.1562	-.4384	-.2908	-.1770	.7214	.1848	.1333	.0850	.1772	.0567	.2313
DPPH												1	.9139	.8183	.7370	-.4487	-.6485	.5107	.5770	.2492	.8185	.7169	.8660	.8116	.1631	-.4757
FRAP													1	.8980	.6744	-.4682	-.6336	.5883	.6427	.1704	.8576	.7561	.8934	.8515	.1817	-.5033
TPC														1	.6376	-.4390	-.6046	.4264	.4936	.2884	.7815	.7000	.7756	.7783	.1281	-.3872
TFC															1	-.4709	-.3821	.5130	.5278	-.0353	.5365	.4595	.6239	.5298	.1086	-.4959
L*(D65)																1	-.1732	-.2412	-.1808	.4199	-.5210	-.3427	-.5303	-.4925	-.3928	.3898
a*(D65)																	1	-.5114	-.6455	-.6606	-.5047	-.4334	-.5740	-.4987	-.1109	.3529
b*(D65)																		1	.9864	-.3058	.3770	.2263	.5935	.3518	.3362	-.7537
C																			1	-.1455	.4305	.2830	.6363	.4069	.3201	-.7374
h(D65)																				1	.2065	.2622	.0971	.2220	-.1737	.2678
Chl a																					1	.8941	.9349	.9955	.1738	-.3189
Chl b																						1	.7525	.9326	-.2758	.0091
Carot-enoids (x+c)																							1	.9130	.3526	-.6167
Chl a+ Chl b																								1	.0816	-.2551
Chl a/ Chl b																									1	-.7331
(Chl a+Chl b)/ (x+c)																										1

Table S7. r-Pearson's coefficients for the correlation between variables for hydroponic samples (as an average over season). L*—lightness, a*, b*—colour chromatic coordinates, h*—hue angle, C*—chroma.

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