

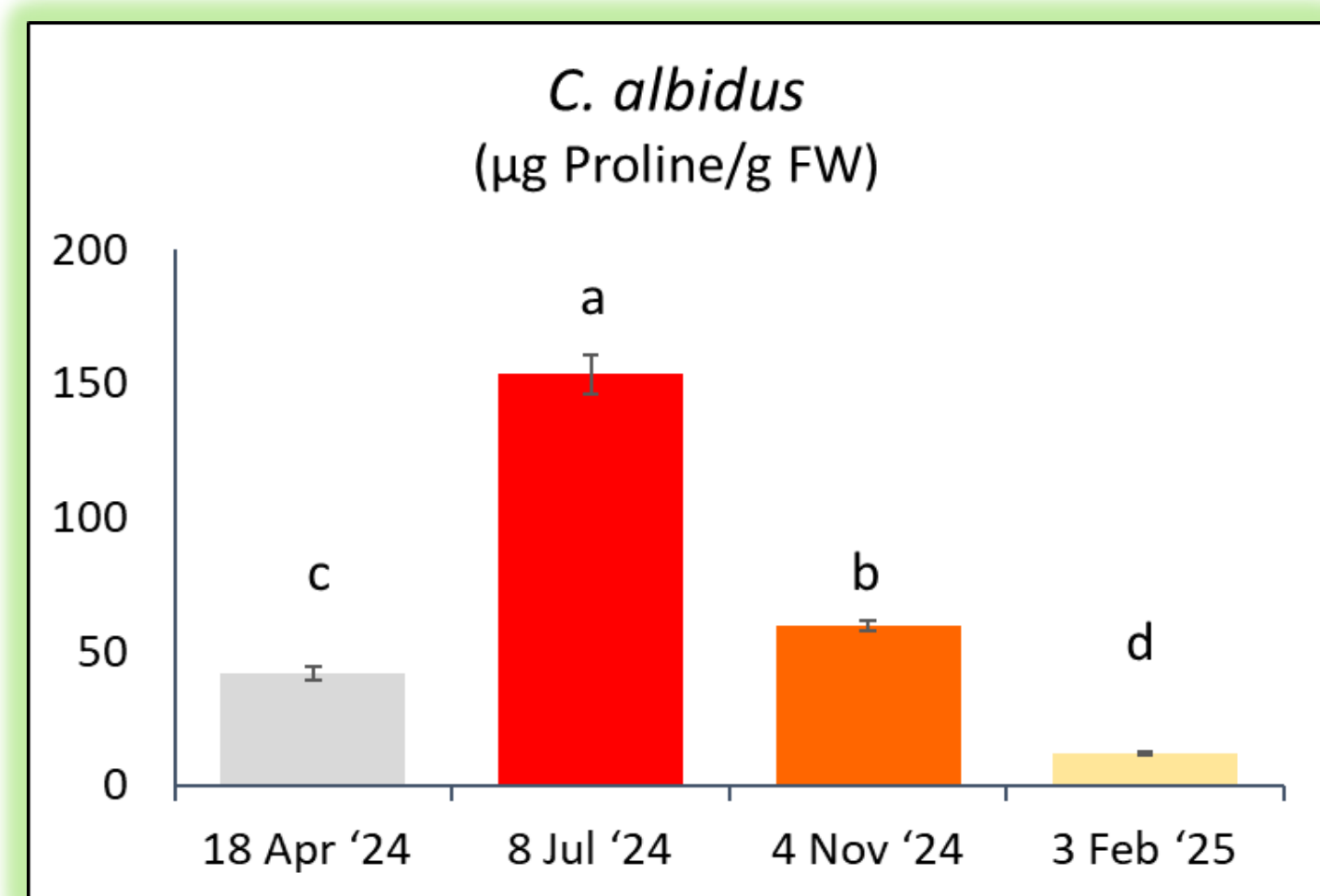
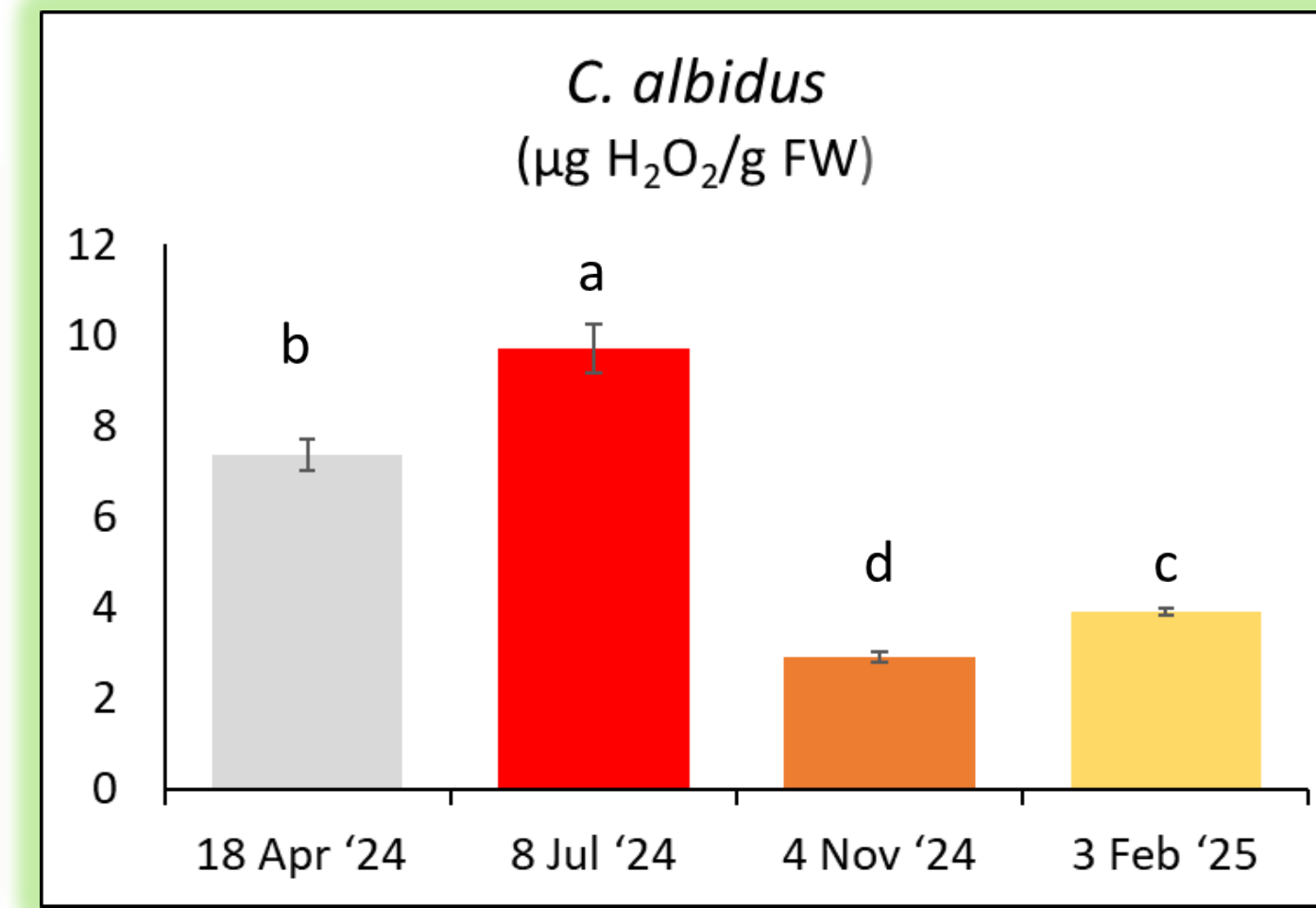
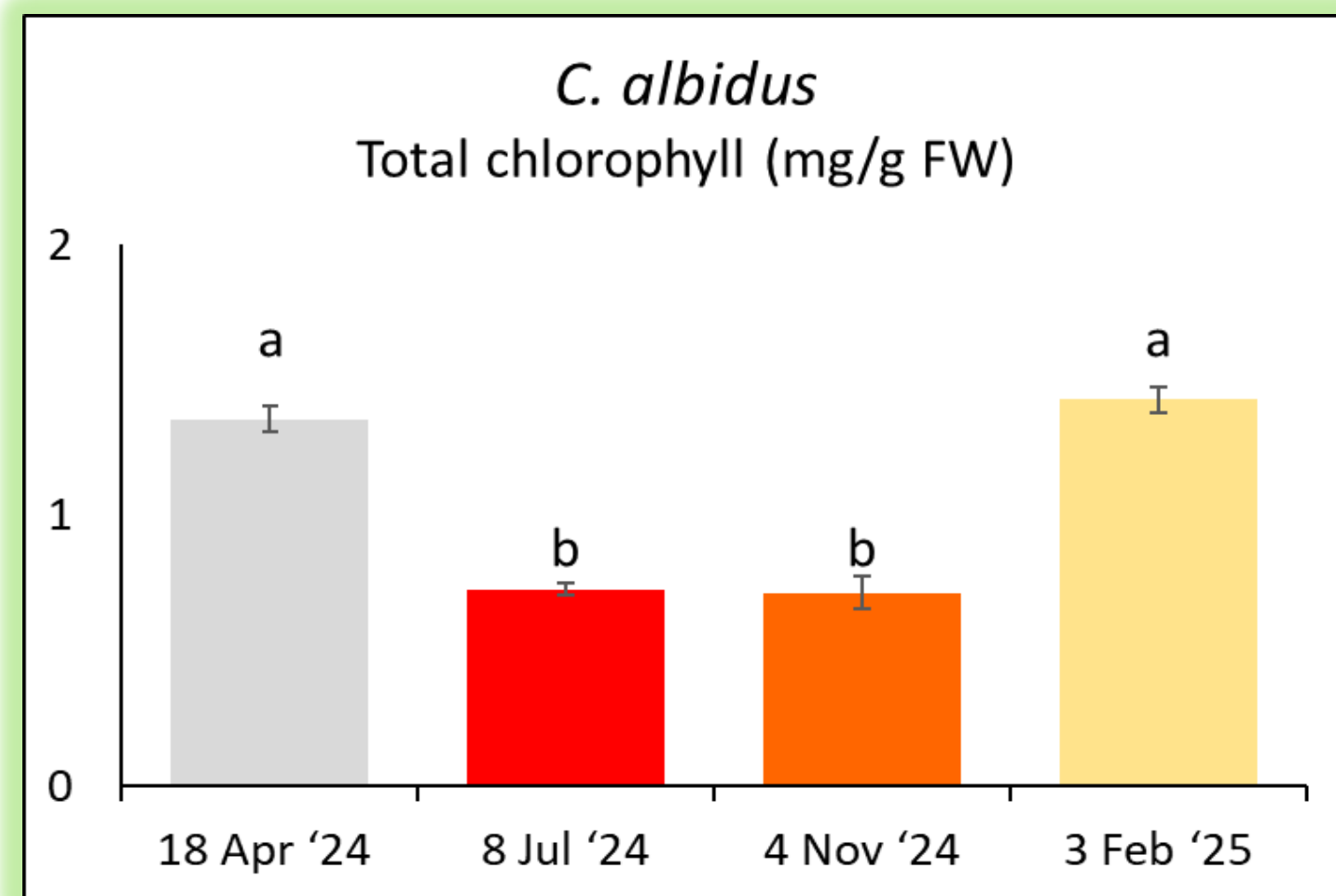
Indicators of environmental stress in *Cistus albidus*, *C. clusii*, and *C. monspeliensis*: seasonal changes



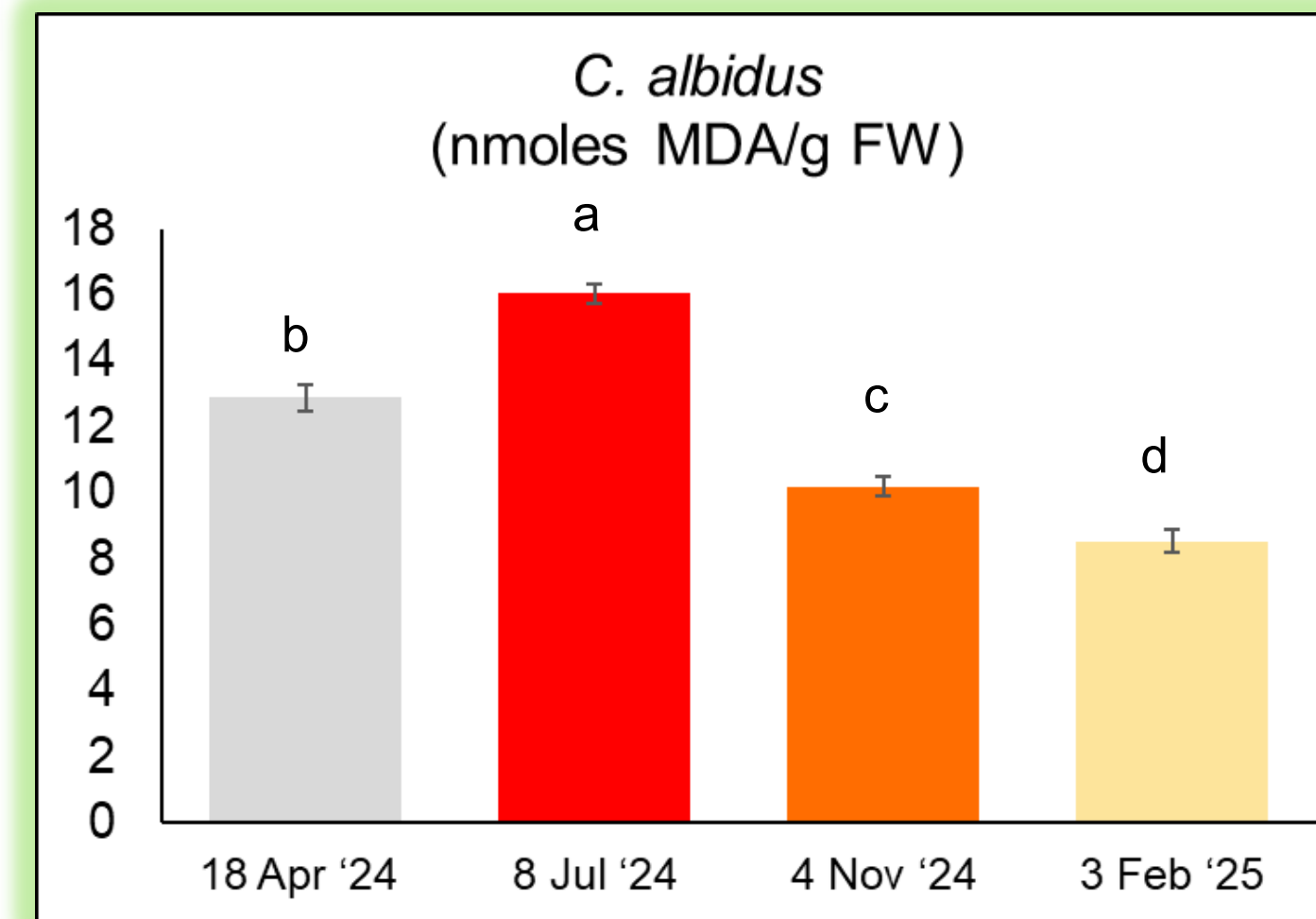
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Cistus albidus



Sampling	Na	K	Mg	Ca	Mn
	(%)				
18 Apr '24	0.0100	1.2400 a	0.3707 a	2.6095 a	0.0063 c
8 Jul '24	0.0083	0.9188 b	0.1977 b	1.4535 bc	0.0044 c
4 Nov '24	0.0096	0.6197 c	0.1657 b	1.1229 c	0.0043 c
3 Feb '25	0.0090	0.7159 c	0.1778 b	1.6574 b	0.0081 a
	NS	***	***	***	***



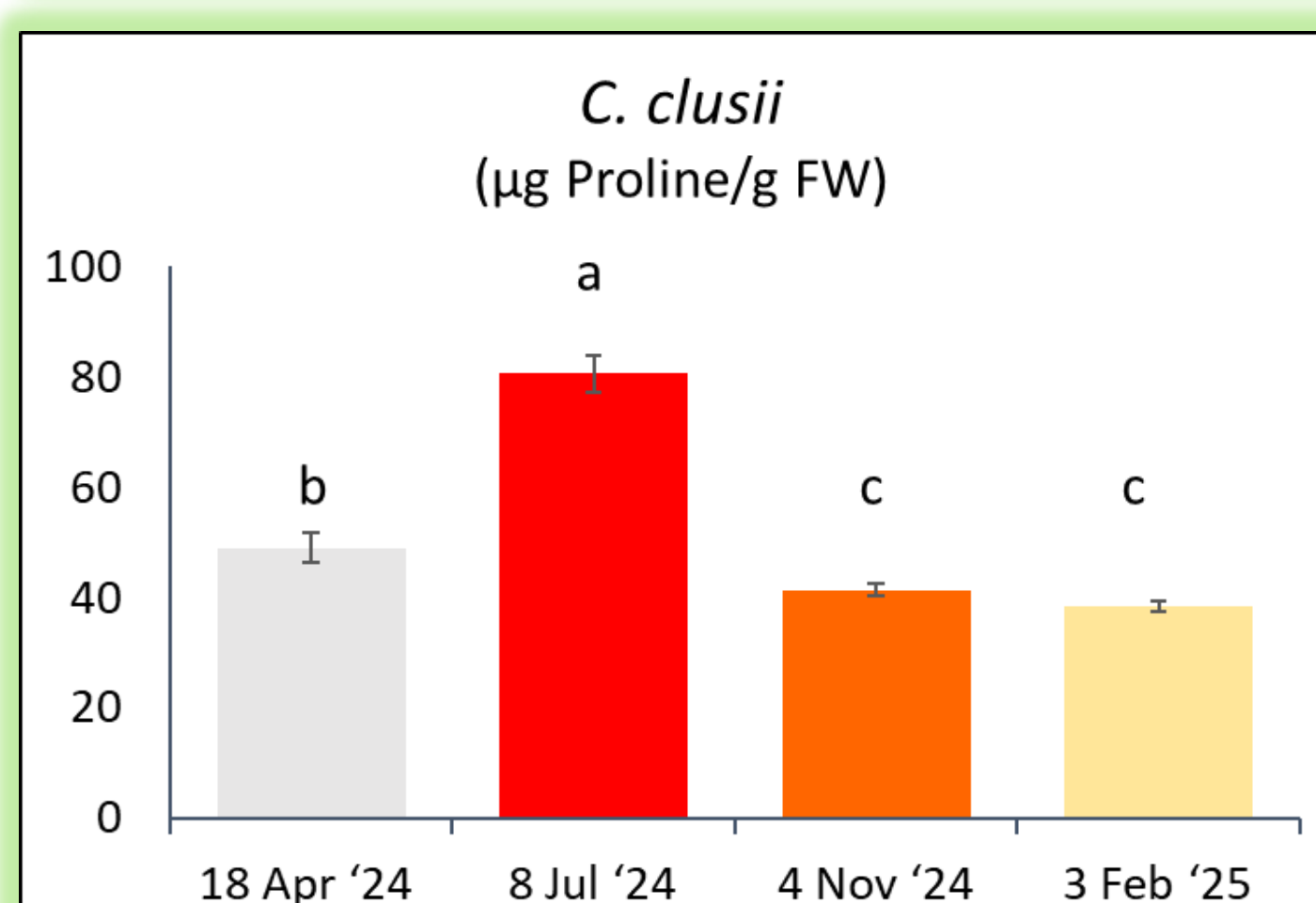
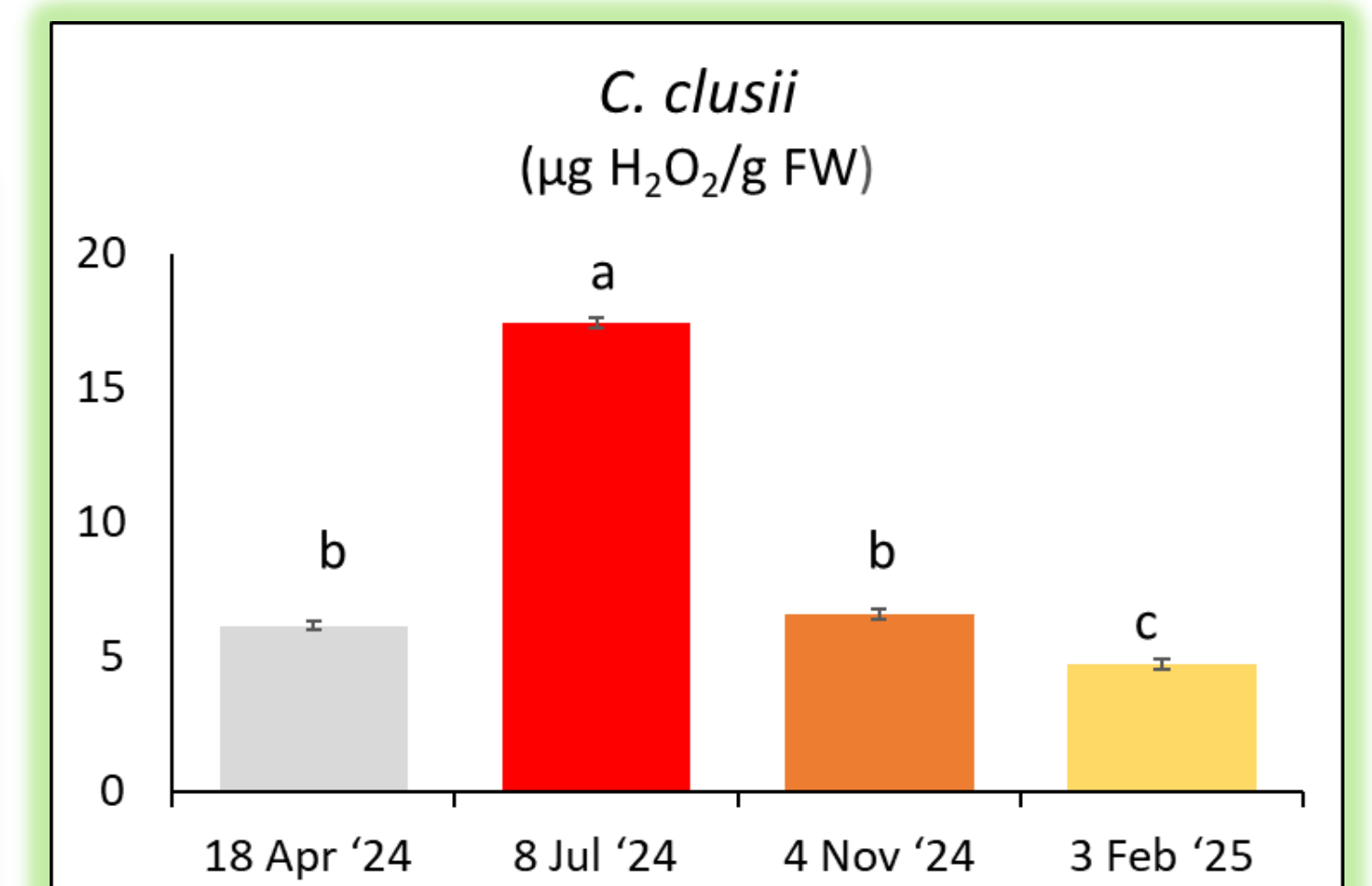
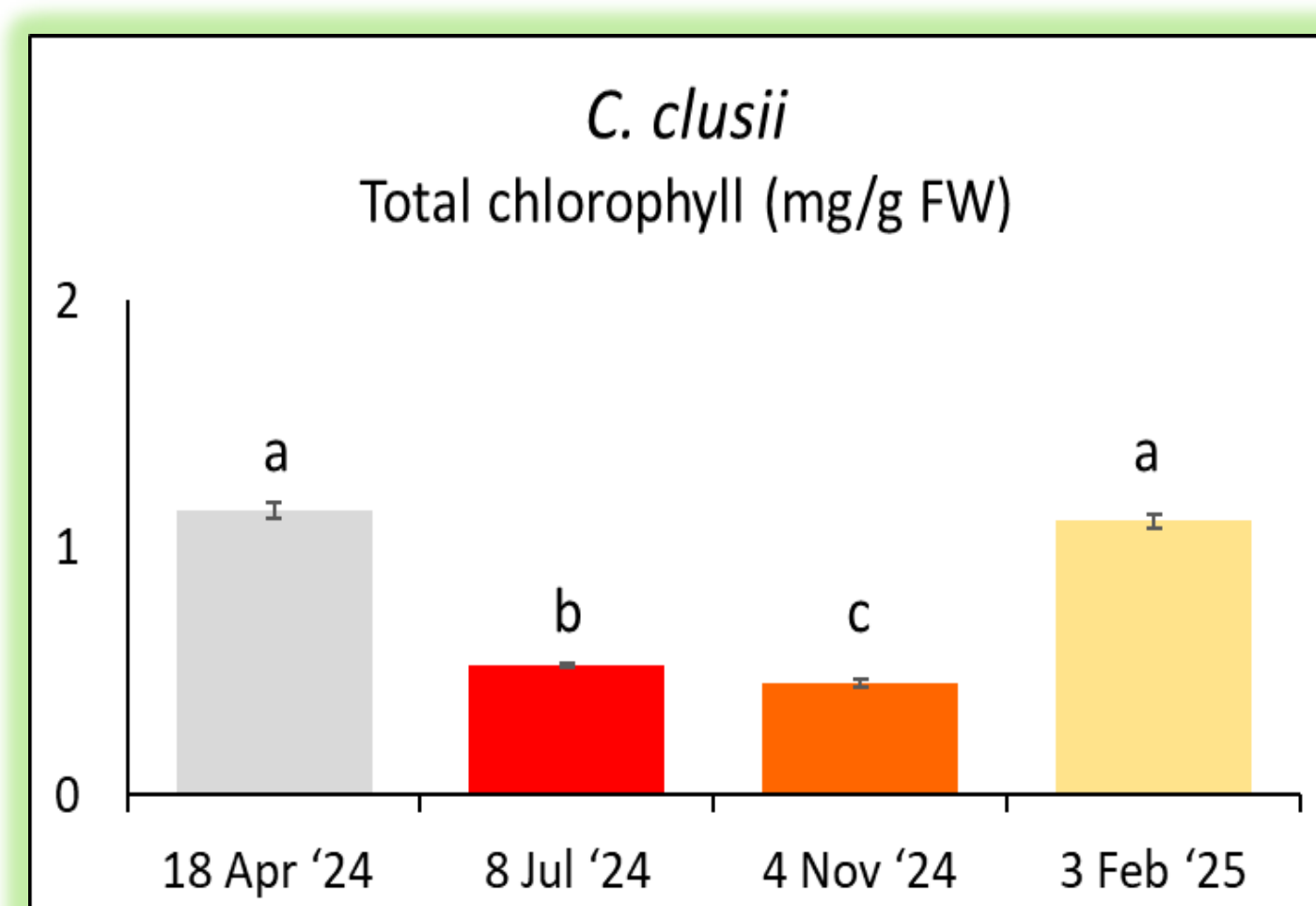
Objective

The aim of this study was to evaluate the physiological and biochemical responses of *Cistus albidus*, *C. clusii*, and *C. monspeliensis* at an intensive monitoring station of the Global Change Observatory of the Subbética Mountains (pine forest of Jódar, province of Jaén)

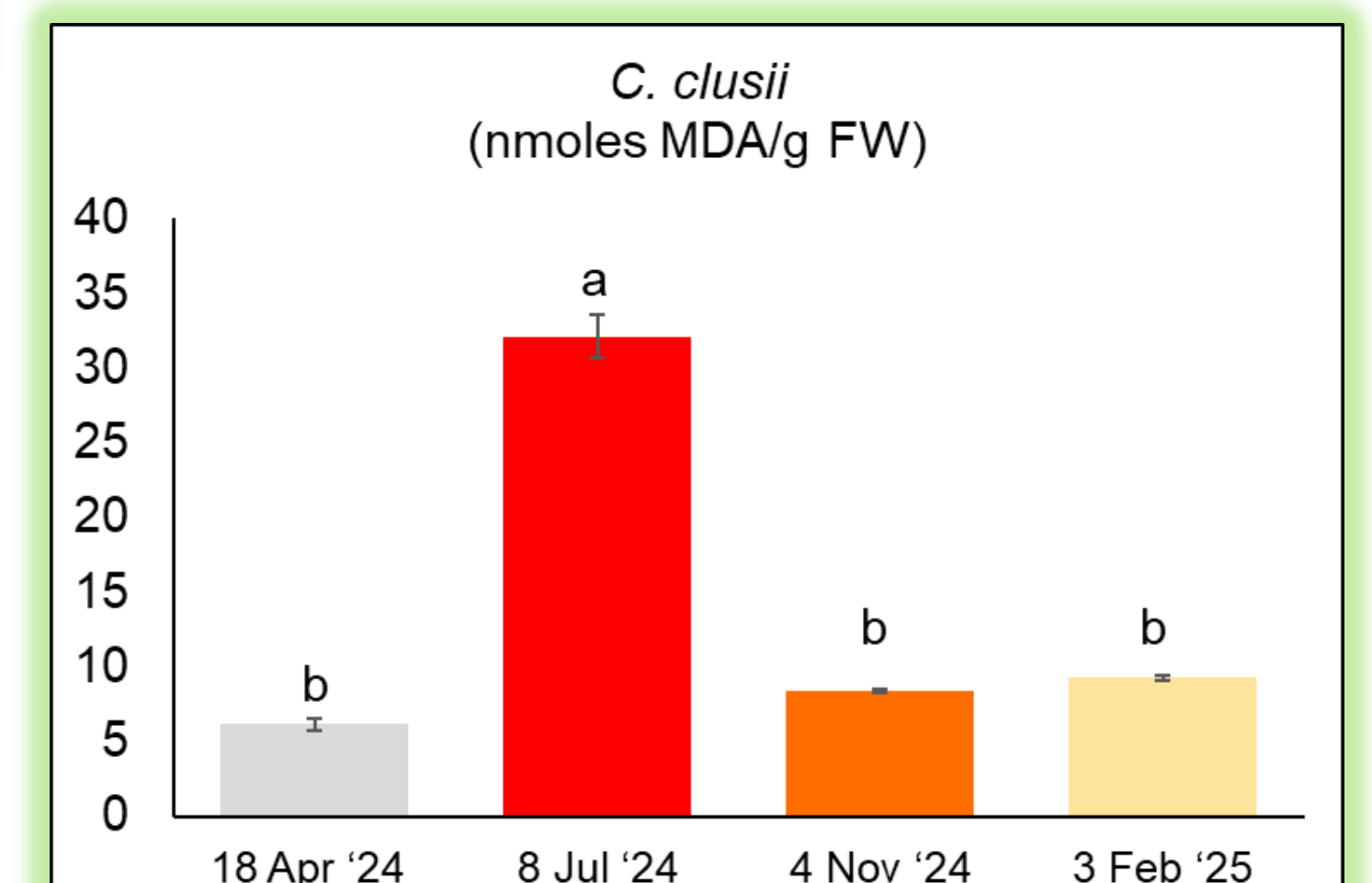
Results

In all three species, chlorophyll levels were highest in spring and winter (LSD test, $P \leq 0.05$). In contrast, proline, hydrogen peroxide, and malondialdehyde (MDA) levels increased in summer.

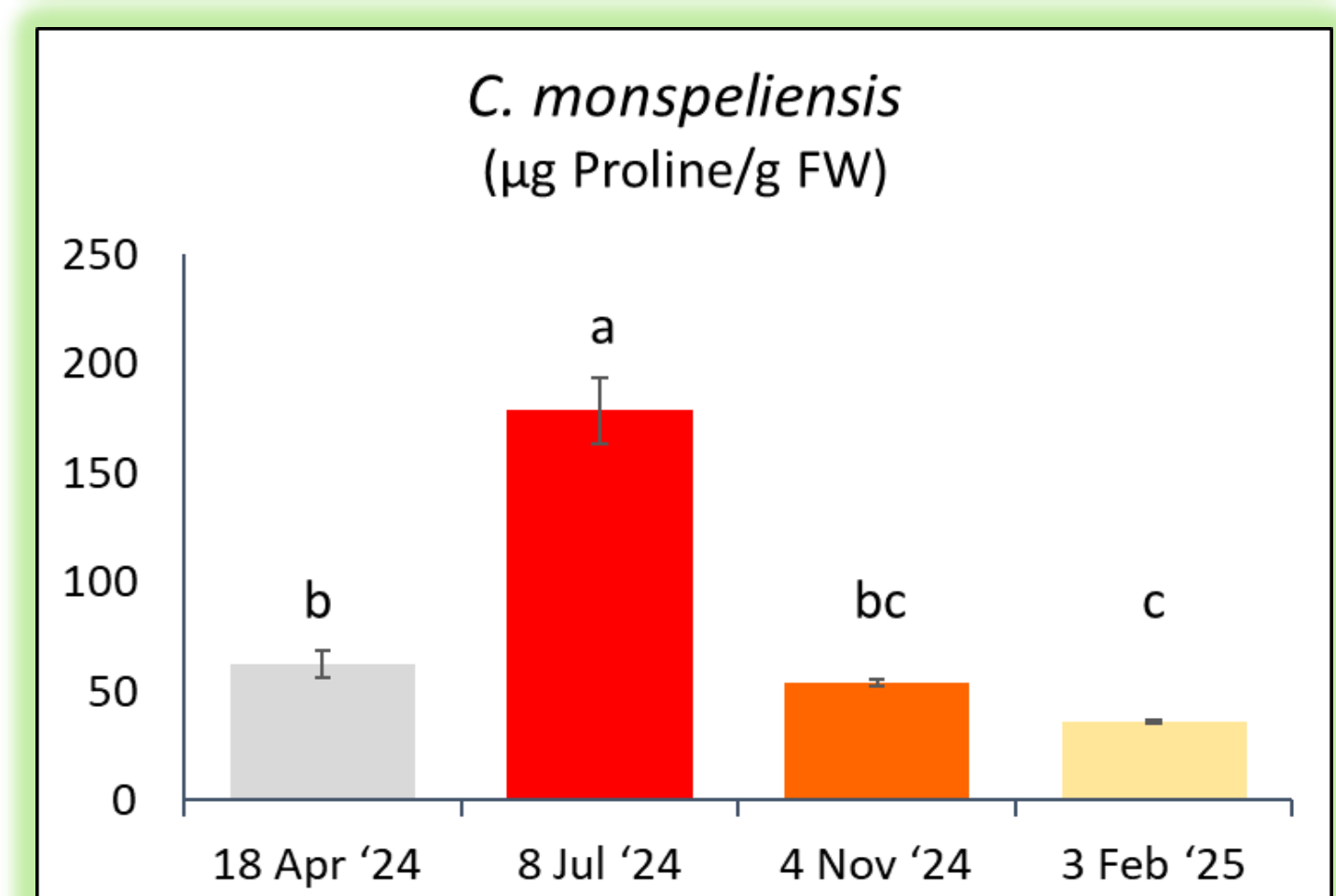
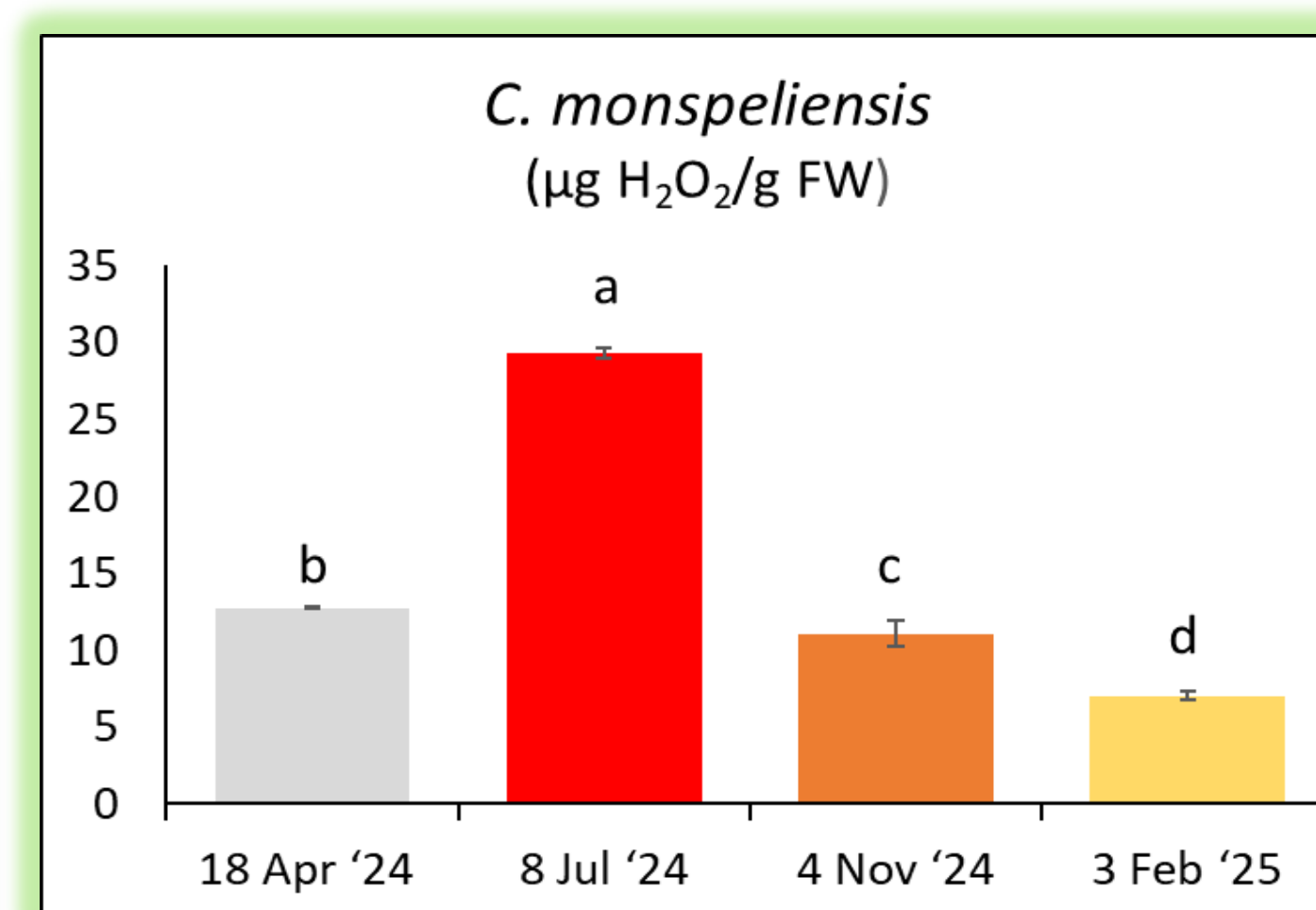
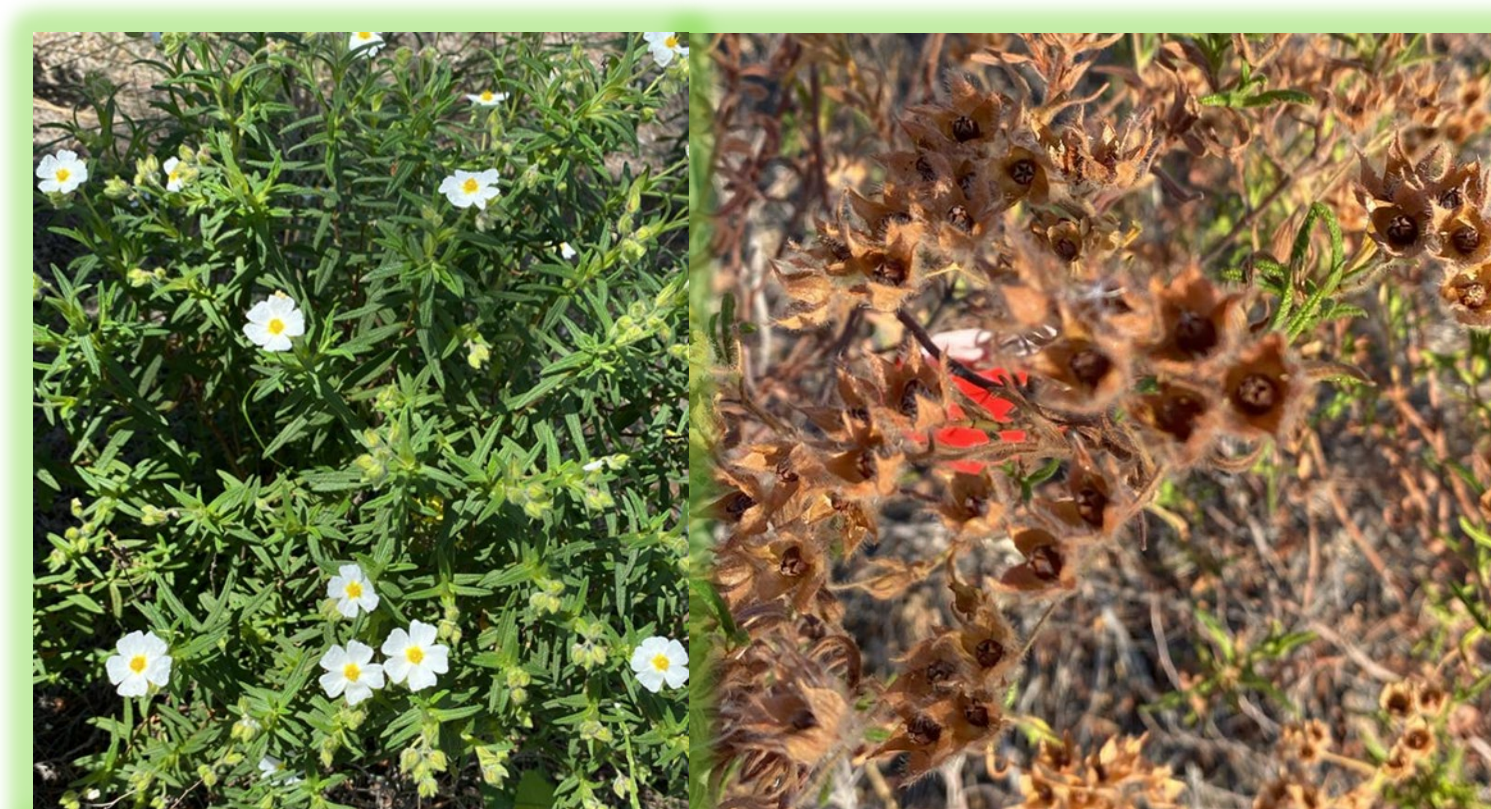
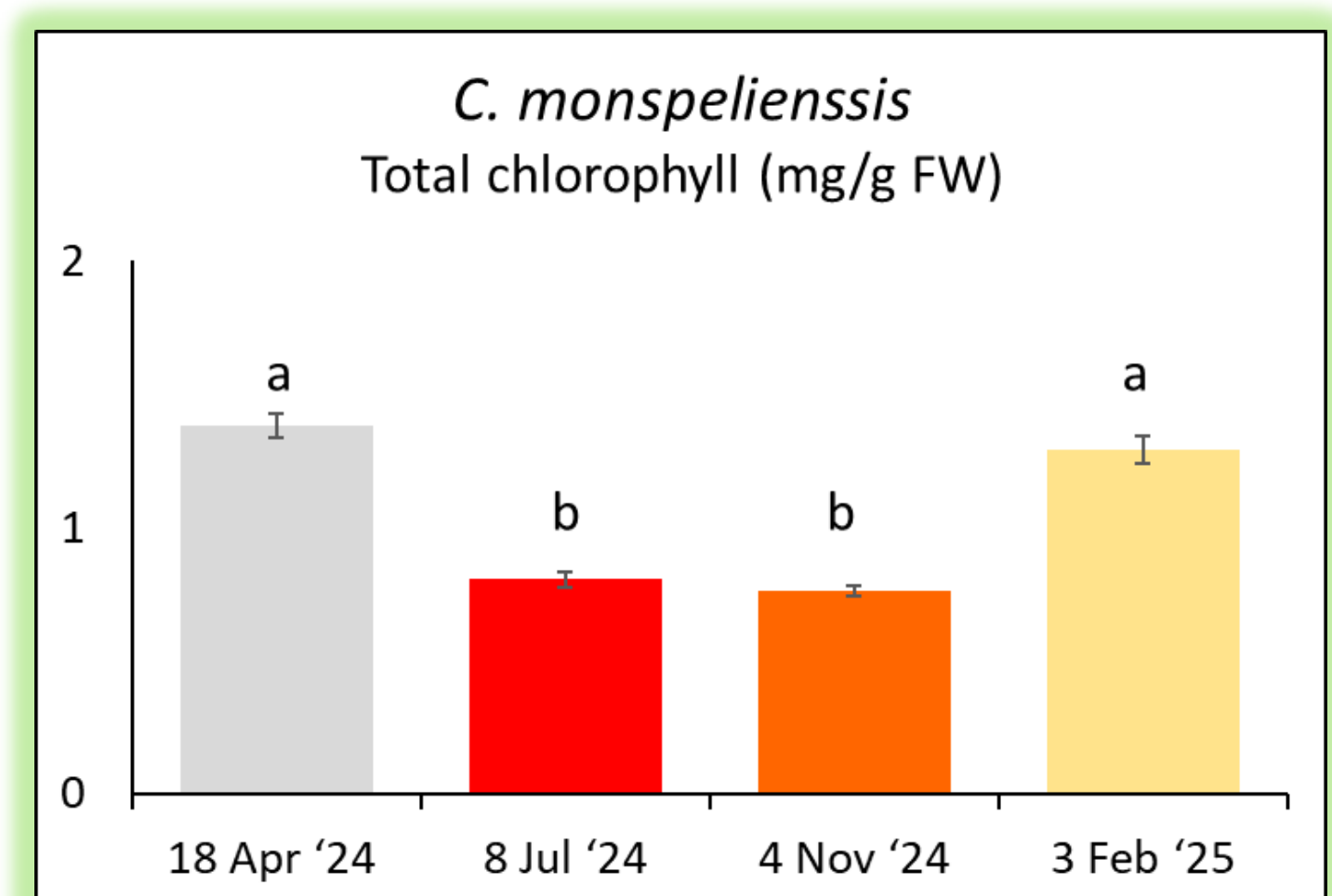
Cistus clusii



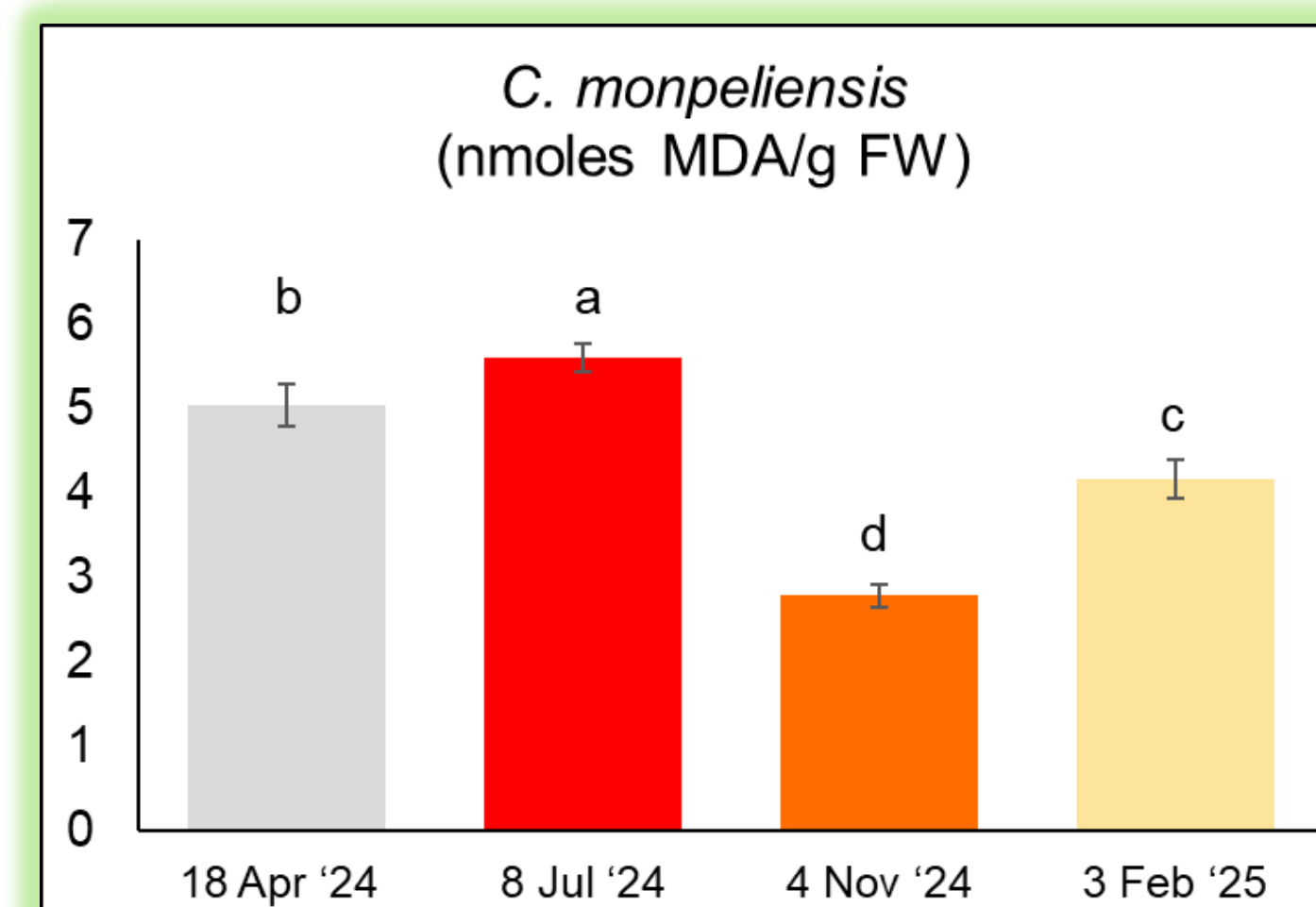
Sampling	Na	K	Mg	Ca	Mn
	(%)				
18 Apr '24	0,0056	0,9332 a	0,3264 a	2,5668 a	0,0108 a
8 Jul '24	0,0064	0,5652 c	0,3089 a	1,9394 b	0,0074 b
4 Nov '24	0,0070	0,4923 c	0,2220 c	1,6760 c	0,0058 c
3 Feb '25	0,0057	0,7241 b	0,2531 b	2,0591 b	0,0100 a
	NS	***	***	***	***



Cistus monspeliensis



Sampling	Na	K	Mg	Ca	Mn
	(%)				
18 Apr '24	0.0137	0.9009	0.2017 b	1.7570 a	0.0083
8 Jul '24	0.0131	0.8411	0.2403 a	1.4908 b	0.0105
4 Nov '24	0.0159	0.7819	0.2413 a	1.4381 b	0.0059
3 Feb '25	0.0159	0.8197	0.2285 a	1.4391 b	0.0072
	NS	NS	**	***	NS



Overall, proline and hydrogen peroxide exhibited the greatest seasonal variation.

In *C. albidus* and *C. clusii*, leaf K, Mg, and Ca contents were higher in spring, as was also the case for Ca in *C. monspeliensis*. However, in *C. monspeliensis*, Mg content was lower in spring. Sodium content in the leaves did not vary across seasons in any of the species studied (LSD test, $P \leq 0.05$).

Conclusion

Leaf proline, hydrogen peroxide, and MDA levels in *C. albidus*, *C. clusii*, and *C. monspeliensis* showed marked seasonal fluctuations, which may be attributable to environmental factors inducing stress responses in these species.