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Enhanced UV-B and Elevated CO2 Impacts Sub-Arctic Shrub Berry Abundance, Quality and Seed Germination

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Table S1: Average monthly temperatures (°C) over the duration of the experiments (1991 – 2009). Data were collected near the experimental sites by Abisko Scientific Research Station. The years when berry data were collected for this study are shaded.

Year	January	February	March	April	May	June	July	August	September	October	November	December
1991	-6.8	-15.5	-7.9	-0.8	2.5	9.4	10.9	11.1	3.9	1.2	-4.2	-2.6
1992	-4.5	-5.1	-4.3	-3.7	4.5	10.2	9.5	8.8	6.9	-3.8	-7.6	-3.7
1993	-6.1	-6.2	-6.9	-3.4	2.9	6.2	12.4	9.8	3.8	-1.7	-3.7	-11.7
1994	-14.6	-10.7	-6.9	0.5	2.5	7.5	11.2	10.5	4.9	0.1	-3.8	-4.2
1995	-7.8	-8.9	-4.5	-3.2	2.1	8.4	10.0	8.9	5.7	0.1	-5.5	-10.1
1996	-7.0	-13.9	-5.9	-2.6	1.0	7.7	11.2	12.1	5.4	1.5	-6.1	-8.6
1997	-7.1	-9.4	-6.0	-4.7	2.7	9.8	13.3	11.6	7.4	-0.2	-6.9	-6.1
1998	-8.3	-12.7	-9.0	-3.2	2.6	8.6	13.0	9.9	5.0	0	-9.5	-8.6
1999	-13.7	-12.3	-6.6	-0.5	2.6	10.3	10.8	8.3	8.0	2.2	-4.0	-8.5
2000	-5.6	-8.8	-5.1	-2.4	4.3	7.7	12.0	10.0	6.4	3.9	-3.8	-7.5
2001	-7.4	-12.2	-11.8	-2.7	3.5	10.3	10.9	10.5	7.9	1.5	-3.1	-7.5
2002	-9.5	-8.9	-7.8	0.8	6.4	11.8	12.7	12.3	5.7	-2.6	-7.9	-10.5
2003	-16.4	-4.9	-3.3	-0.8	4.8	9.2	14.9	11.4	5.7	-0.1	-2.8	-7.0
2004	-14.3	-7.7	-4.4	4.0	4.7	7.9	13.4	11.3	6.4	0.7	-3.6	-4.0
2005	-7.2	-9.2	-8.0	8.0	2.8	9.5	13.5	10.8	6.1	2.8	-2.5	-8.6
2006	-6.2	-9.0	-11.5	0.1	5.2	8.5	11.2	12.5	6.9	-1.1	-3.8	-3.4
2007	-10.2	-15.1	-2.6	-0.4	3.6	9.6	12.7	10.6	5.0	3.4	-3.9	-2.9
2008	-7.4	-6.2	-9.3	-1.8	3.0	8.7	11.9	8.9	5.3	1.2	-5.1	-6.2
2009	-8.3	-13.0	-7.6	-1.3	6.2	8.2	12.1	12.2	7.0	-1.1	-4.2	-10.2

Table S2: Average monthly precipitation (mm) over the duration of the experiments (1991 – 2009). Data were collected near the experimental sites by Abisko Scientific Research Station. The years when berry data were collected for this study are shaded.

Year	January	February	March	April	May	June	July	August	September	October	November	December	Annual Total
1991	23	2	23	2	10	44	30	25	28	30	50	38	305.0
1992	45	37	15	11	18	25	89	20	18	23	18	84	403.0
1993	38	38	75	3	29	28	56	76	8	26	4	26	407.0
1994	25	12	10	7	9	17	29	28	13	22	17	25	214.0
1995	8	15	14	7	25	29	22	66	5	73	37	23	324.0
1996	27	10	9	24	16	50	26	49	8	25	26	12	282.0
1997	86	16	39	19	14	4	48	25	21	23	8	38	341.0
1998	22	67	8	4	19	27	60	61	24	39	11	23	365.0
1999	12	8	1	17	18	54	94	26	36	36	61	9	372.0
2000	31	33	24	17	32	50	47	62	23	25	3	12	359.0
2001	15	23	4	12	22	61	90	63	22	23	32	10	377.0
2002	66.2	25.3	12.4	9	12.5	12.6	84.9	32	43.1	5.9	2.9	14	320.8
2003	37.9	9.4	60.4	2.8	18	22	45.3	55.9	53	37	7.2	54	402.9
2004	4.4	21.7	6	4.6	7.5	39.5	177.4	35.9	62.9	13.2	24.3	15.3	412.7
2005	39.6	4.1	12.3	13.8	26.1	35.4	37.8	94.5	32.6	26.6	22.6	18.9	364.3
2006	24.6	16.2	5.7	3.1	13.6	55.8	38.7	21.2	72.7	19.4	12	35.7	318.7
2007	16.9	22.7	12.2	18.9	42.7	13.8	70	45.7	41.9	16.7	20.9	26.2	348.6
2008	12.6	27.1	4.8	10.2	12.6	55.7	32.2	28.1	28.2	15.1	22.1	13	261.7
2009	16	15.8	8.6	19	38.3	14.9	18.2	52.7	29.3	20.8	2.4	3.9	239.9

Table S3: Average monthly photosynthetically active radiation (PAR) ($\mu\text{mol m}^{-2}$) over the duration of the experiments (1991 – 2009). Data were collected near the experimental sites by Abisko Scientific Research Station. The years when berry data were collected for this study are shaded.

Year	January	February	March	April	May	June	July	August	September	October	November	December
1991	3.33	43.08	153.00	355.48	444.40	416.37	288.17	260.38	148.11	38.69	8.07	0.53
1992	3.55	34.21	155.00	337.93	417.28	520.56	345.07	239.24	128.73	54.03	7.43	0.10
1993	3.06	39.32	150.97	345.71	435.17	417.03	374.10	222.23	159.30	48.46	7.57	0.71
1994	3.52	33.43	152.48	315.79	412.54	391.62	395.77	270.07	175.87	54.89	8.54	0.52
1995	3.21	35.04	138.38	332.67	435.77	378.33	335.10	219.84	156.10	50.58	7.93	0.55
1996	3.77	37.61	158.35	302.32	471.86	365.76	337.93	273.14	152.69	38.97	6.92	0.17
1997	2.60	38.25	145.68	329.80	441.81	483.97	428.23	258.29	123.27	52.68	7.43	0.83
1998	2.73	29.07	145.10	284.07	310.19	402.00	295.39	199.42	121.37	41.03	8.70	0.81
1999	3.13	38.46	138.23	273.80	416.77	378.67	277.55	218.39	151.37	45.03	5.63	0.81
2000	2.94	33.28	136.97	290.27	351.77	326.93	350.74	187.96	132.77	47.61	6.63	0.81
2001	3.06	32.14	153.65	299.60	346.23	367.87	316.57	200.48	114.04	40.00	6.80	0.68
2002	3.13	33.38	132.52	290.97	367.23	400.60	292.10	314.23	142.80	65.55	8.17	1.19
2003	3.61	34.61	141.87	333.70	406.68	442.03	431.03	273.87	158.27	66.26	7.97	0.94
2004	3.90	36.59	151.94	337.60	397.10	402.47	355.39	299.26	139.47	57.26	6.53	0.97
2005	3.74	41.86	156.06	327.17	416.19	408.67	429.06	241.58	160.57	48.58	7.10	0.84
2006	3.35	36.04	163.11	316.87	410.77	382.59	351.45	339.90	122.50	56.29	7.97	0.77
2007	3.81	42.07	166.13	301.57	406.23	482.63	415.81	289.55	138.90	56.13	8.00	0.81
2008	3.45	37.86	172.58	330.43	404.26	423.80	447.03	300.16	174.77	55.77	8.03	0.74
2009	3.87	39.50	167.58	324.30	447.65	490.03	393.61	297.74	136.10	63.06	8.87	0.71

Figure S1: Data show the efficacy of CO₂ control by the open top chamber systems to confirm analyses conducted previously (Gwynn-Jones et al. 1997). These data show mean CO₂ concentration over all 16 plots for the years 2009-2011 measured using an LCA 4 Infrared gas analyser (ADC bioscientific Ltd) during a week of intensive CO₂ sampling late July of each season. The target CO₂ concentration was 600 ppm, these elevated CO₂ data reflect slightly lower calibration of the Infrared gas analyser in 2009 and windier conditions. Overall data show consistent measurement of ambient CO₂ 360 ±10% (control) and 600 ±10% (Elevated CO₂) and effective control by the system.

