Effects of Nitrogen Dioxide on Biochemical Responses in 41 Garden Plants (2019)

Relative leaf chlorophyll (Chl) a content, Chl b content and carotenoid contents (folds) in different plant functional groups treated without nitrogen dioxide (NO_2) (-NO_2), with 72 h NO_2 stress (+NO_2) or after 30 d of natural recovery (NR).

	Number of Species	Specific Leaf Area	Relative Chl a Content			Relative Chl b Content			Relative Carotenoid Content		
Life from			**−NO_2**	**+NO_2**	**NR**	**−NO_2**	**+NO_2**	**NR**	**−NO_2**	**+NO_2**	**NR**
Herb	8	69,216	1	0.43 ± 0.06**	0.9 ± 0.09	1	0.61 ± 0.12**	0.83 ± 0.09	1	0.34 ± 0.17**	0.66 ± 0.30*
Shrub	23	111,837	1	0.58 ± 0.09**	0.96 ± 0.05	1	0.35 ± 0.04**	0.9 ± 0.14	1	0.48 ± 0.04**	0.96 ± 0.05
Tree	10	129,284	1	0.7 ± 0.07**	1.1 ± 0.06	1	0.88 ± 0.06	1.21 ± 0.12*	1	0.33 ± 0.03**	0.92 ± 0.03**
Evergreen	5	215,042	1	0.9 ± 0.05*	1.15 ± 0.07*	1	0.94 ± 0.09	1.25 ± 0.07**	1	0.92 ± 0.17	1.03 ± 0.04
Deciduous	5	17,669	1	0.59 ± 0.05**	1.07 ± 0.07	1	0.84 ± 0.16	1.19 ± 0.08	1	0.49 ± 0.03**	0.85 ± 0.01**
Broadleaf	39	126,381	1	0.62 ± 0.08**	0.95 ± 0.08	1	0.57 ± 0.14**	0.94 ± 0.05	1	0.47 ± 0.01**	0.86 ± 0.06**
Needle-like	2	987,404	1	0.31 ± 0.11**	0.82 ± 0.03*	1	0.35 ± 0.04**	0.75 ± 0.1**	1	0.24 ± 0.02**	0.51 ± 0.03**
Phylogeny											
Gymnosperm	4	469,349	1	0.39 ± 0.03**	0.92 ± 0.04*	1	0.48 ± 0.04**	0.73 ± 0.18*	1	0.28 ± 0.06**	0.9 ± 0.04*
Angiosperm	37	104,701	1	0.57 ± 0.06**	0.99 ± 0.08	1	0.7 ± 0.09*	0.93 ± 0.12	1	0.48 ± 0.04**	0.93 ± 0.01*
Monocotyledon	7	68,862	1	0.38 ± 0.07**	0.82 ± 0.07**	1	0.55 ± 0.05**	0.79 ± 0.09*	1	0.36 ± 0.02**	0.64 ± 0.03**
Dicotyledon	30	113,064	1	0.61 ± 0.02**	1.02 ± 0.1	1	0.73 ± 0.09*	0.96 ± 0.19	1	0.52 ± 0.02**	1.01 ± 0.02
Photosynthetic pathway											
C4 herb	4	2668	1	0.36 ± 0.03**	0.96 ± 0.08	1	0.58 ± 0.11**	0.9 ± 0.08	1	0.35 ± 0.01**	0.83 ± 0.01**
C3 herb	4	91,399	1	0.55 ± 0.04**	1.45 ± 0.1**	1	0.54 ± 0.21*	0.7 ± 0.24	1	0.33 ± 0.06**	0.52 ± 0.04**
All species	41	146,532	1	0.59 ± 0.03**	0.97 ± 0.08	1	0.61 ± 0.12**	0.96 ± 0.03	1	0.46 ± 0.02**	0.89 ± 0.01**

The data are based on at least three individual measurements in each plant species. In each functional group, the data in the -NO_2 group is taken as the baseline data, and those in the corresponding +NO_2 and NR groups are presented as the mean ± standard errors of the folds compared to the corresponding baseline data. One-way analysis of variance after Levene's test was performed for statistical analysis. In case of heterogeneity of variance, nonparametric Kruskal-Wallis one-factor analysis of variance was used. * $p < 0.05$ and ** $p < 0.01$ compared to the corresponding -NO_2 group in the same functional group.

Source: https://www.mdpi.com/2223-7747/8/2/45/htm

Effects of Nitrogen Dioxide on Biochemical Responses in 41 Garden Plants (2019)

Relative Ca, Mn, and Zn contents (folds) in different plant functional groups treated without nitrogen dioxide (NO_2) (–NO_2), with 72 h NO_2 stress (+NO_2) or after 30 d of natural recovery (NR).

	Relative Ca Content			Relative Mn Content			Relative Zn Content		
Life from NR	**−NO_2**	**+NO_2**	**NR**	**−NO_2**	**+NO_2**	**NR**	**−NO_2**	**+NO_2**	
Herb	1	1.16 ± 0.41	0.94 ± 026*	1	1.57 ± 1.38	0.95 ± 0.60	1	1.08 ± 0.29	1.07 ± 0.90*
Shrub	1	1.07 ± 0.39	1.07 ± 0.36	1	1.24 ± 1.76	1.44 ± 0.91	1	0.95 ± 0.32	0.95 ± 0.62**
Tree	1	1.03 ± 0.42	0.94 ± 0.25*	1	2.80 ± 5.53	0.77 ± 1.03**	1	0.83 ± 0.39**	0.94 ± 0.30
Evergreen	1	1.94 ± 0.54**	1.09 ± 0.24	1	1.32 ± 1.11	0.53 ± 0.46**	1	0.70 ± 0.18**	0.99 ± 0.16
Deciduous	1	0.93 ± 0.20	0.78 ± 0.16**	1	4.27 ± 7.58	1.01 ± 1.36*	1	0.95 ± 0.50	0.89 ± 0.39
Broadleaf	1	1.04 ± 0.35	1.00 ± 0.32	1	1.65 ± 3.19*	1.51 ± 1.91	1	0.96 ± 0.35**	0.98 ± 0.64**
Needle-like	1	1.35 ± 0.85	1.23 ± 0.34	1	2.64 ± 0.09	0.30 ± 0.12	1	0.71 ± 0.12**	0.92 ± 0.01
Gymnosperm	1	1.04 ± 0.66*	1.00 ± 0.34	1	1.79 ± 1.02	0.44 ± 0.32**	1	0.93 ± 0.34	0.91 ± 0.20
Angiosperm	1	1.06 ± 0.35	1.01 ± 0.32	1	1.68 ± 3.27*	1.56 ± 1.95	1	0.95 ± 0.34**	0.98 ± 0.65**
Monocotyledon	1	1.21 ± 0.41	1.00 ± 0.23	1	1.77 ± 1.30	2.57 ± 3.85	1	1.10 ± 0.31	1.00 ± 0.95**
Dicotyledon	1	1.03 ± 0.33	1.01 ± 0.34	1	1.66 ± 3.58*	1.33 ± 1.03	1	0.91 ± 0.34**	0.98 ± 0.57**
Photosynthetic pathway									
C_4 herb	1	1.46 ± 0.38*	1.08 ± 0.26	1	1.73 ± 1.11	0.84 ± 0.39	1	1.06 ± 0.40	1.24 ± 1.20*
C_3 herb	1	0.85 ± 0.08**	0.80 ± 0.16**	1	1.46 ± 1.52	1.07 ± 0.76	1	1.12 ± 0.15	0.90 ± 0.43
All species	1	1.06 ± 0.39	1.01 ± 0.32	1	1.69 ± 3.12	1.38 ± 2.12	1	0.95 ± 0.34**	0.98 ± 0.62**

The data are based on at least three individual measurements in each plant species. In each functional group, the data in the −NO_2 group is taken as the baseline data, and those in the corresponding +NO_2 and NR groups are presented as the mean ± standard errors of the folds compared to the corresponding baseline data. One-way analysis of variance after Levene's test was performed for statistical analysis. In case of heterogeneity of variance, nonparametric Kruskal-Wallis one-factor analysis of variance was used. * $p < 0.05$ and ** $p < 0.01$ compared to the corresponding -NO_2 group in the same functional group.

Source: https://www.mdpi.com/2223-7747/8/2/45/htm

Nitrogen Management Affects Nitrous Oxide Emissions under Varying Cotton Irrigation Systems in the Desert Southwest, USA (2018)

Table 1. Nitrous oxide emissions as affected by N management in overhead sprinkler–irrigated 'DP 1044 RR F' cotton, Maricopa, AZ, 2014 and 2015.

Nitrogen treatment	Fertilizer source	Fertilizer rate		Seasonal N_2O flux		N_2O emission factor	
		2014	2015	2014	2015	2014	2015
		kg N ha^{-1}		gN_2O-N ha^{-1} $91d^{-1}$	gN_2O-N ha^{-1} $113d^{-1}$	——— % ———	
1. Zero-N		0	0	75 b†	285 c	–	–
2. Soil test-based N‡	UAN§	179	131	1123 a	1620 b	0.58 a	1.01 a
3. 1.3*soil test-based N‡	UAN	233	170	1240 a	2830 a	0.53 a	1.05 a
4. Soil test-based N‡	UAN + Agrotain Plus	179	131	269 b	856 bc	0.15 a	0.44 a
5. Reflectance-based N-1	UAN	90	66	1013 ab	783 c	1.11 a	0.77 a
6. Reflectance-based N-2#	UAN	116	85	705 ab	1099 bc	0.60 a	0.95 a
7. Reflectance-based N-1	UAN + Agrotain Plus	90	66	646 ab	761 c	0.71 a	0.72 a
8. Reflectance-based N-2#	UAN + Agrotain Plus	116	85	532 b	935 bc	0.45 a	0.72 a
SE				269	332	0.3	0.4

† Means in a column followed by a similar letter are not statistically different at P = 0.05.
‡ Based on lint yield goal of 2240 kg ha−1 and a 224 kg N ha−1 N requirement minus 0- to 90-cm soil NO3–N and estimated irrigation input of 22 kg N ha−1 (estimated 100-cm irrigation of 2 mg L−1 NO3–N water). § UAN, urea ammonium nitrate.
First split equals 50% treatment 2; second and third splits based on normalized difference vegetation index (NDVI) relative to treatment 2.
First split equals 50% treatment 2, second and third splits based on NDVI relative to treatment 3.

Source:https://www.researchgate.net/publication/322459549_Nitrogen_Management_Affects_Nitrous_Oxide_Emissions_under_Varying_Cotton_Irrigation_Systems_in_the_Desert_Southwest_USA

Nitrous Oxide Emissions from Turfgrass Receiving Different Irrigation Amounts and Nitrogen Fertilizer Forms (2018)

Table 1: Analysis of fertilizer main effect, irrigation main effect, and fertilizer ´ irrigation interaction on cumulative N_2O emissions during the summer periods (June–August) in Year 1 (2015), Year 2 (2016), and both summers combined.

	Cumulative summer N_2O emissions		
Source of variation	Year 1	Year 2	Total
	——— N_2 O-N kg ha^{-1} ———		
Fertilizer			
Urea	1.82a†	1.77a†	3.59a†
Polymer-coated urea (PCU)	1.18b	1.35b	2.53b
Unfertilized (UF)	0.974c	1.31b	2.28c
Irrigation‡			
Medium	1.36a§	1.53a¶	2.88a#
Low	1.29b	1.42 b	2.71b
Fertilizer ´ irrigation			
Urea ´ medium	1.84	1.84	3.68a§
Urea ´ low	1.80	1.70	3.50b
PCU ´ medium	1.26	1.42	2.68c
PCU ´ low	1.10	1.27	2.37d
UF ´ medium	0.975	1.32	2.29d
UF ´ low	0.973	1.29	2.27d
	ANOVA		
Source		*p*-value††	
Fertilizer	**<0.0001**	**<0.0001**	**<0.0001**
Irrigation	**0.0289**	**0.0027**	**0.0006**
Fertilizer x Irrigation	0.0901	0.2046	**0.0437**

† Within fertilizer main effect, means in column with different letters are significantly different according Fisher's LSD (P £ 0.0001).
‡ Medium irrigation level was at 72% reference evapotranspiration (ET0) replacement in 2014, at 68% ET0 replacement from 1 June to 19 July in 2015, and then at 66% ET0 replacement from 20 July to 1 September in 2015 and entire summer period in 2016. The low irrigation level was at 54% ET0 replacement in 2014, at 45% ET0 replacement from 1 June to 19 July in 2015, and then at 33% ET0 replacement from 20 July to 1 September in 2015 and entire summer period in 2016.
§ Within the source of variation, means in columns with different letters are significantly different according to Fisher's LSD (P £ 0.05).
¶ Within the source of variation, means in columns with different letters are significantly different according to Fisher's LSD (P £ 0.01).
# Within the source of variation, means in columns with different letters are significantly different according to Fisher's LSD (P £ 0.001).
†† Bolded p-values are significant at either the 0.05, 0.01, or 0.001 probability level.

Nitrous Oxide Emissions from Turfgrass Receiving Different Irrigation Amounts and Nitrogen Fertilizer Forms (2018)

Table 1:Analysis of fertilizer main effect, irrigation main effect, and fertilizer ´ irrigation interaction on 2-yr total cumulative N_2O emissions for the summer periods (June– August), offseason period (September–May), and the combined total of the entire 2-yr period.

	Cumulative N_2O emissions		
Source of variation	**Total summer**	**Total offseason**	**Combined total for enti period**
	----------N	**ON_2 kg ha^{-1}**	----------
Fertilizer			
Urea	3.59a†	2.03a‡	5.62a‡
Polymer-coated urea (PCU)	2.53b	1.97a	4.50b
Unfertilized (UF)	2.28c	1.78b	4.06c
Irrigation			
Medium	2.88a§	1.89	4.77
Low	2.71b	1.97	4.68
Fertilizer ´ irrigation			
Urea ´ medium	3.68a¶	1.95	5.63
Urea ´ low	3.50b	2.11	5.61
PCU ´ medium	2.68c	1.96	4.64
PCU ´ low	2.37d	1.99	4.36
UF ´ medium	2.29d	1.75	4.04
UF ´ low	2.27d	1.80	4.07
ANOVA			
Source	p-value#		
Fertilizer	**<0.0001**	**0.0011**	**<0.0001**
Irrigation	**0.0006**	0.1404	0.2180
Fertilizer x Irrigation	**0.0437**	0.5550	0.2093

† Within a source of variation, means in columns with different letters are significantly different according to Fisher's LSD (P £ 0.0001).
‡ Within a source of variation, means in columns with different letters are significantly different according to Fisher's LSD (P £ 0.01).
§ Within a source of variation, means in columns with different letters are significantly different according to Fisher's LSD (P £ 0.001).
¶ Within a source of variation, means in columns with different letters are significantly different according to Fisher's LSD (P £ 0.05).
# Bolded p-values are significant at either the 0.05, 0.01, or 0.001 probability level.

Source:
https://www.researchgate.net/publication/325075860_Nitrous_Oxide_Emissions_from_Turfgrass_Receiving_Different_Irrigation_Amounts_and_Nitrogen_Fertilizer_Forms

Management of pig manure to mitigate NO and yield-scaled N_2O emissions in an irrigated Mediterranean crop (2017)

Table 1: Cumulative N_2O-N emissions over the different periods of field experiment and total cumulative NO-N, CH_4-C and, CO_2-C fluxes in the different fertilizer (C, control, U, urea, COM, compost, LFPS, liquid fraction of pig slurry, LFPSI, liquid fraction of pig slurry + DMPP) and irrigation (S, sprinkler, D, drip) treatments.

Effect	**N_2O cumulative emission (g N_2O-N ha ^{1})**			**Total N_2O-N**	**NO cumulative emission**	**CH_4 cumulative emission**	**CO_2 cumulative emission**
	Period I	Period II	Period III	(g N_2O-N ha ^{1} y ^{1})	(kg NO-N ha ^{1} y ^{1})	(g CH_4-C ha ^{1} y ^{1})	(Mg CO_2-C ha ^{1} y ^{1})
Irrigation x fertilizer	P = 0.200	P = 0.042	P = 0.238	P = 0.026	P = 0.03	P = 0.652	P = 0.32
S.E.	13.7	80.8	31.0	91.1	0.3	102.6	0.1
Irrigation	P = 0.867	P = 0.000	P = 0.032	P = 0.000	P = 0.000	P = 0.000	P = 0.000
S	69.5	517.7 b	123.7 b	710.8 b	2.4 a	358.3 a	0.69 b
D	53.9	130.6 a	65.5 a	261.2 a	3.8 b	96.0 b	0.25 a
S.E.	6.2	36.1	13.8	40.7	0.1	45.9	0.03
Fertilizer	P = 0.000	P = 0.001	P = 0.157	P = 0.000	P = 0.000	P = 0.070	P = 0.006
C	21.5 a	53.3 a	60.9	138.6 a	2.4 a	163.8 ab	0.44 a
U	20.6 a	634.1 c	126.6	781.9 c	3.1 bc	332.1 a	0.43 a
COM	122.7 c	421.1 bc	113.9	664.7 bc	3.5 c	112.1 b	0.61 b
LFPS	95.3 c	327.2 bc	104.7	529.1 b	3.9 c	163.1 ab	0.37 a
LFPSI	48.2 b	198.7 ab	66.8	315.9 a	2.6 ab	365.1 a	0.50 a
S.E.	9.7	57.1	21.9	64.4	0.2	72.5	0.04

Different letters within columns indicate significant differences by applying the Tukey's honest significance test at $P < 0.05$.
Standard Error (S.E.) is given for each effect.
The variables N_2O (Period II), total N_2O, NO and CO_2 were log-transformed before the ANOVA.

Source: https://www.sciencedirect.com/science/article/pii/S016788091630473X