

Structural and physiological analyses in Salsoleae (Chenopodiaceae) indicate multiple transitions among C₃, intermediate and C₄ photosynthesis.

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Table S1 and S2 show quantitative information on different tissue measured from light micrographs of leaf cross sections. Results from this study show the first four species, *S. genistoides*, *S. masenderanica*, *S. montana*, and *S. webbi* are C₃ species, and *S. divaricata* is a C₃-C₄ intermediate. Data is also shown for *S. arbusculiformis* a C₃-C₄ intermediate (Voznesenskaya et al 2001) the C₄ species *X. richteri*, *C. orientale*, and the C₄ species *S. arbuscula* (see Voznesenskaya et al. 2001).

Appendix S1 includes review of the sampling information for phylogenetic analysis. GenBank accession numbers for ITS sequences follow species names. This includes numbers for the new sequence information that was generated in this study for *S. genistoides* and *S. webbi*; the corresponding voucher numbers of specimens available at the WSU herbarium are:

Salsola genistoides Juss. ex Poir WS386418

Salsola webbi Moq. WS386419

Table S1. Mesophyll cell (M1, M2), hypodermal cell (H), bundle sheath cell (BS), Kranz like cell (KLC), and Kranz cell (KC) sizes of *Salsola* s.l. species. The C₃ species have BS cells, the C₃-C₄ species have KLC, the C₄ species have KC and H cells (instead of M1).

Species	M1or H		M2		Ratio M1/M2, H/M2		M1+M2	BS, KLC, KC
	Length μm	Width μm	Length μm	Width μm	Length	Width	Length μm	Area μm ²
<i>S. genistoides</i> C ₃	72.3±2.4	17.9±0.5	84.3±2.4	19.3±0.5	0.9	0.9	168.4±3.9	935.0±106.9
<i>S. masenderanica</i> C ₃	106.4±4.4	31.3±4.4	153.4±8.1	29.0±1.3	0.7	1.1	230.8±6.1	785.8±42.5
<i>S. montana</i> C ₃	153.1±9.3	35.7±2.1	152.8±7.5	33.4±1.9	1.0	1.1	317.6±7.9	836.6±58.4
<i>S. webbii</i> C ₃	85.0±5.1	28.5±1.3	79.8±3.7	31.5±0.8	1.1	0.9	146.1±4.4	666.0±42.0
<i>S. arbusculiformis</i> C ₃ -C ₄	38.3±1.9	12.8±0.5	63.0±1.6	10.3±0.3	0.6	1.2	102.0±14.9	207.3±17.5
<i>S. divaricata</i> C ₃ -C ₄	48.4±2.5	20.5±0.7	100.1±1.7	12.5±0.5	0.5	1.6	158.9±2.9	544.3±35.1
<i>C. orientale</i> , C ₄	28.5±2.7	26.1±2.2	69.7±2.3	14.7±1.7	0.4	1.8	94.3±4.4	611.1±43.0
<i>X. richteri</i> , C ₄	32.5±2.5	30.5±1.4	55.6±1.5	12.5±0.4	0.6	2.5	72.1±3.4	331.4±22.6

Table 2S. Volume density of tissues (%) and ratios of M/BS in C₃, M/KLC in C₃-C₄, and M/KC in C₄ species of representative *Salsola* s.l.

Species	% volume density of tissue in leaves							
	Epidermis	Hypoderm	M	BS KLC KC	Chlorenchyma	WS	Central cylinder	M/BS M/KLC M/KC*
<i>S. genistoides</i> C ₃	9.8±0.1	n/a	64.7±0.2	4.5±0.9	69.2±0.7	20.0±0.6	0.9±0.04	15.0
<i>S. masenderanica</i> C ₃	10.1±0.2	n/a	54.1±6.5	6.8±0.9	61.0±5.5	27.1±5.3	1.8±0.3	9.0
<i>S. montana</i> C ₃	9.2±0.9	n/a	57.5±6.3	4.0±0.3	61.5±6.3	28.0±6.9	1.4±0.2	14.7
<i>S. webbii</i> C ₃	16.9±0.9	n/a	57.4±6.1	6.8±0.5	64.2±5.8	17.8±3.3	1.0±0.3	8.7
<i>S. arbusculiformis</i> C ₃ -C ₄	7.8±0.1	n/a	49.5±0.2	4.7±0.1	54.2±0.3	35.5±0.1	2.5±0.4	10.5
<i>S. divaricata</i> C ₃ -C ₄	7.1±0.5	n/a	31.2±1.3	6.1±0.3	37.3±1.2	54.7±0.5	0.9±0.3	5.2
<i>C. orientale</i> , C ₄ NAD-ME	11.4±0.1	10.2±1.1	28.5±1.2	6.4±0.02	34.9±1.3	42.6±0.1	0.9±0.2	4.5
<i>X. richteri</i> , C ₄ NADP-ME	11.9±1.6	12.8±0.1	19.2±2.3	10.0±1.4	29.2±3.7	36.9±11.0	9.2±5.8	1.9
<i>X. arbuscula</i> C ₄ NADP-ME	13.5±0.4	12.9±0.6	24.6±0.6	11.8±0.4	36.4±0.2	35.4±0.1	1.8±0.1	2.1

*Ratio of the volume densities of M tissue to BS, M to KLC, and M to KC tissue.

Appendix S1. Sampling table for phylogenetic analysis. GenBank accession numbers for ITS sequences follow species names.

Anabasis aphylla L., EF453380, HM131608, HM131609; *A. brevifolia* C.A.Mey., HM131610; *A. calcarea* (Charif & Aellen) Bokhari & Wendelbo, EF453381; *A. cretacea* Pall., HM131611; *A. elatior* (C.A.Mey.) Schischk., HM131612; *A. eriopoda* (C.A.Mey.) Benth., EF453383, HM131613; *A. eugeniae* Iljin, EF453384; *A. hausskenchtii* Bunge ex Boiss., EF453386, EF453387; *A. iranica* Iljin, EF453382; *A. jaxartica* (Bunge) Benth. ex Volkens, EF453385; *A. pellicotii* Danguy, HM131614; *A. truncata* (Schrenk) Bunge, HM131615; *Caroxylon canescens* (Moq.) Akhani & Roalson, EF453503; *C. chorassanicum* (Botsch.) Akhani & Roalson, EF453487; *Climacoptera korshinskyi* (Drob.) Botsch., AY556441; *C. subcrassa* (M.Pop.) Botsch., AY556440; *Cornulaca aucheri* Moq., EF453405; *C. monacantha* Delile, EF453406; *Cyatobasis fruticulosa* (Bunge) Aellen, EF453516; *Girgensohnia imbricata* Bunge, EF453412; *G. minima* K.Korov., EF453413; *G. oppositiflora* (Pall.) Fenzl, EF453414, HM131626; *Halogeton alopecuroides* (Delile) Moq., EF453430; *H. arachnoideus* Moq., HM131630; *H. glomeratus* (M.Bieb.) C.A.Mey., EF453431, HM131631; *Halothamnus glaucus* (M.Bieb.) Botsch., EF453434; *H. auriculus* (Moq.) Botsch., EF453433; *H. auriculus* subsp. *acutifolius* (Moq.) Kothe-Heinr., EF453432; *H. subaphyllus* (C.A.Mey.) Botsch., EF453435; *Haloxylon ammodendron* (C.A.Mey.) Bunge ex Fenzl, EF453436, HM131632; *H. persicum* Bunge ex Boiss. & Buhe, EF453438, HM131633; *Hammada articulata* (Moq.) O.Bolos & Vigo, EF453440; *H. griffithii* (Moq.) Iljin, EF453437; *H. salicornica* (Moq.) Iljin, EF453439; *Horaninowia platyptera* Charif & Aellen, EF453441; *H. pungens* (Gilli) Botsch., EF453442; *H. ulicina* Fisch. & C.A.Mey, EF453443, HM131634; *Iljinia regelii* (Bunge) Korov., HM131635; *Noaea major* Bunge, EF453450; *N. minuta* Boiss. & Ball, EF453451; *N. mucronata* (Forssk.) Asch. & Schweinf., EF453452; *Ofaiston monandrum* (Pall.) Moq., EF453453; *Petrosimonia brachiata* (Pall.) Bunge, EF453457; *Raphidophyton regelii* (Bunge) Iljin, EF453459; *Salsola annua* (Bunge) Akhani, EF453389; *S. aperta* Pauls., HM131644; *S. arbuscula* Pall., HM131645; *S. arbusculiformis* Drob., EF453468, HM131646; *S. chinghaiensis* A.J.Li, HM131647; *S. collina* Pall., HM131649, HM131648; *S. divaricata* Masson ex Link, EF453474; *S. drummondii* Ulbr., EF453475; *S. florida* (M.Bieb.) Poir., EF453507; *S. foliosa* (L.) Schrad., AF318652, HM131651; *S. genistoides* Poir., KF110741; *S. griffithii* (Bunge) Freitag & Khani, EF453482; *S. kernerii* (Wol.) Botsch., EF453486; *S. komarovii* Iljin, HM131654; *S. lachnantha* (Botsch.) Botsch., EF453488; *S. laricifolia* Turcz. ex Litv., HM131655; *S. masenderanica* Botsch., EF453504; *S. monoptera* Bunge, HM131658, HM131659, HM131660; *S. montana* Litv., EF453489, EF453490; *S. nitraria* Pall., AY556439; *S. paulsenii* Litv., AF318647, HM131663; *S. pellucida* Litv., HM131664; *S. praecox* Litv., AY556442, HM131665; *S. rosacea* L., HM131666; *S. rosmarinus* (Ehrenb. ex Boiss.) Akhani, EF453506; *S. ruthenica* Iljin, HM131667, HM131668; *S. soda* L., EF453496, EF453497; *S. stocksii* Boiss., EF453512; *S. "touranica"*, EF453505; *S. tragus* L., AF318648, HM131652; *S. vvdenskyi* Iljin & M.Popov, EF453462; *S. webbii* Moq., KF110740; *S. zaidamica* Iljin, HM131669, HM131670; *S. zygophylla* Batt. ex Trab., AF318651; *S. zygophylloides* (Aellen & Townsend) Akhani, EF453513; *Sympegma regelii* Bunge, EF453510, HM131676; *Traganum nudatum* Del., EF453511; *Turania aperta* (Pauls.) Akhani, EF453466; *T. deserticola* (Iljin) Akhani, EF453473; *Xylosalsola arbuscula* (Pall.) Tzvelev., EF453467; *X. chivensis* (M.Pop.) Akhani & Roalson, AF318642; *X. richteri* (Moq.) Akhani & Roalson, EF453494.