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Extraction of Liquid Fuels and Chemicals from Terrestrial Higher Plants. Part I. Yields from a Survey of 614 Western United States Plant Taxa

Robert P. Adams,* Manuel F. Balandrin,† Kathleen J. Brown, Gregory A. Stone, Suzann M. Gruel

NPI-Plant Resources Institute, University of Utah Research Park, 417 Wakara Way, Salt Lake City, Utah 84108, USA

and

Marvin O. Bagby

Northern Regional Research Center, United States Department of Agriculture, Agricultural Research Service, 1815 North University Street, Peoria, Illinois 61604, USA

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ABSTRACT

In an effort to identify higher plants which may be useful as alternative new sources of fuels or chemical feedstocks, 832 *plants representing* 614 *taxa from the arid and semi-arid regions of the western United States were collected and analyzed for their yields of nonpolar (hexane-extractable) and polar (methanol-extractable) constituents. Taxa with yields of up to 16·4% (dry weight) of nonpolar extractables (i.e.* Chrysothamnus paniculatus, Parthenium argentatum) *and up to 43·3% (dry weight) of polar extractables (i.e.* Rhus trilobata, Stillingia sylvatica) *were identified. A complete list of all of the taxa surveyed, with yields, is included so that low-yielding taxa can be eliminated from subsequent surveys and further consideration.*

Key words: solvent extraction, herbaceous plants, energy, biomass, fuels.

*Present address: Hardin-Simmons University Science Research Center — Utah, 8555 S. Escalante Drive, Sandy, Utah 84092, USA.
†To whom correspondence should be addressed.

INTRODUCTION

The several shortages of liquid fuels since the Arab oil embargo of 1973 have spurred a search for alternative sources of hydrocarbons from plants.[1-25] Considerable research efforts have recently been directed towards investigating the suitability of whole-plant hydrocarbon-like extracts from resinous and latex-bearing herbaceous plants as alternative bio-renewable sources of fuels and chemical feedstocks. Research efforts in this area have been the subject of a recent review.[26] In this paper we report on the yields of nonpolar (hexane-extractable) and polar (methanol-extractable) constituents from 832 vascular plants from the western United States, representing 614 distinct taxa in 269 genera from 66 plant families (see Table 1 and Appendix). The detailed chemical characterization of the highest-yielding taxa will be presented elsewhere.

MATERIALS AND METHODS

Plant collection

Herbaceous plants representing the flora from central Kansas west to the Sierra Nevada mountains and from Mexico to Canada (see Fig. 1) were collected and analyzed between 1981 and 1984. The following taxonomists and plant collectors collaborated in this project: Dr Robert P. Adams, Mr G. Michael Alder, Ms Kathleen J. Brown, and Ms Susan M. White, NPI-Plant Resources Institute, Salt Lake City, Utah (Great Basin collections); Dr W. Dennis Clark and Mr Marc A. Baker, Department of Botany and Microbiology, Arizona State University, Tempe, Arizona (Mojave-Sonoran Desert collections); Dr Amy Jean Gilmartin, Ms Joy D. Mastrogiuseppe, and Ms Karen S. Simmons, Department of Botany, Marion Ownbey Herbarium, Washington State University, Pullman, Washington (Columbia Plateau collections); Dr Walter A. Kelley, Department of Biological Sciences, Mesa College, Grand Junction, Colorado (Colorado Plateau collections); Mr Elmer Kingsford, Logan, Utah; Dr John La Duke, University of North Dakota, Grand Forks, North Dakota (Northern Great Plains collections); Dr A. Michael Powell, Department of Biology, Sul Ross State University, Alpine, Texas (Chihuahuan Desert collections); and Prof. Richard G. Walter, Department of Botany and Plant Pathology, Colorado State University, Fort Collins, Colorado (Central Great Plains collections).

In plant collections, preference was given to perennial, weedy, aggressive species, and to those taxa showing some evidence of accumulation

TABLE 1

Average Yields of Nonpolar (Hexane-Extractable) and Polar (Methanol-Extractable) Plant Constituents, Average Total Yields, and Intercorrelation Between Nonpolar and Polar Extract Yields by Family

Family (no. genera/no. taxa)	*Number of accessions, N*	*Average hexane % ± SD*	*Average MeOH % ± SD*	*Average total %*	*Hexane–MeOH% correlation coefficient, r*
Agavaceae (3/4)	4	3·52 ± 1·78	22·81 ± 3·68	26·33	—[a]
Amaranthaceae (2/6)	7	1·43 ± 0·30	15·25 ± 6·50	16·68	−0·23 (NS)[b]
Anacardiaceae (1/7)	11	4·52 ± 1·98	29·74 ± 5·95	34·26	0·05 (NS)
Apiaceae (Umbelliferae) (4/6)	7	2·98 ± 1·60	20·83 ± 5·47	23·81	0·69 (NS)
Apocynaceae (1/2)	2	5·76 ± 0·74	21·46 ± 3·80	27·22	—
Asclepiadaceae (2/18)	24	4·97 ± 2·11	18·50 ± 4·30	23·47	−0·21 (NS)
Asteraceae (Compositae) (82/237)	349	4·49 ± 2·81	17·44 ± 4·92	21·93	−0·02 (NS)
Berberidaceae (1/2)	2	1.98 ± 0·64	22·30 ± 3·80	24·28	—
Bignoniaceae (2/2)	4	3·55 ± 0·82	28·88 ± 2·03	32·43	—
Boraginaceae (4/7)	7	2·51 ± 1·22	12·70 ± 2·82	15·21	0·21 (NS)
Brassicaceae (Cruciferae) (12/15)	21	2·15 ± 1·05	17·78 ± 5·37	19·93	0·28 (NS)
Buxaceae (Simmondsiaceae) (1/1)	1	2·99	18·98	21·97	—
Capparidaceae (4/7)	10	2·93 ± 1·45	18·82 ± 4·37	21·75	−0·31 (NS)
Caprifoliaceae (2/2)	2	3·85 ± 3·41	18·59 ± 5·02	22·44	—
Caryophyllaceae (2/3)	4	2·40 ± 0·48	24·75 ± 9·84	27·15	—
Celastraceae (1/1)	2	10·54 ± 0·18	18·94 ± 0·50	29·48	—
Chenopodiaceae (9/16)	26	1·78 ± 0·48	18·39 ± 5·91	20·17	0·33 (NS)
Cistaceae (1/1)	1	1·99	18·12	20·11	—
Clusiaceae (Hypericaceae) (1/1)	5	5·78 ± 2·79	22·42 ± 4·18	28·20	—
Convolvulaceae (2/2)	2	3·16 ± 1·70	22·36 ± 11·87	25·52	—
Cucurbitaceae (2/2)	3	2·22 ± 0·71	19·51 ± 2·89	21·73	—
Dipsacaceae (1/1)	1	1·52	18·11	19·63	—
Ebenaceae (1/1)	1	4·28	23·55	27·83	—

(*continued*)

TABLE 1 — *contd.*

Family (no. genera/no. taxa)	*Number of accessions, N*	*Average hexane % ± SD*	*Average MeOH % ± SD*	*Average total %*	*Hexane–MeOH% correlation coefficient, r*
Elaeagnaceae (2/3)	3	3·38 ± 1·71	20·79 ± 5·63	24·17	—
Ephedraceae (1/2)	2	1·66 ± 0·33	19·76 ± 4·05	21·42	—
Ericaceae (2/5)	8	4·50 ± 1·60	31·70 ± 2·38	36·20	0·06 (NS)
Euphorbiaceae (8/18)	26	5·03 ± 2·74	19·49 ± 8·40	24·52	−0·19 (NS)
Fabaceae (Leguminosae) (19/38)	44	2·65 ± 1·49	18·73 ± 4·57	21·38	−0·17 (NS)
Fagaceae (1/4)	4	2·19 ± 1·02	19·18 ± 1·57	21·37	—
Fouquieriaceae (1/1)	1	7·41	14·78	22·19	—
Garryaceae (1/1)	2	4·76 ± 0·72	23·00 ± 0·60	27·76	—
Geraniaceae (2/7)	10	2·18 ± 0·88	26·55 ± 6·33	28·73	0·52 (NS)
Hydrophyllaceae (4/6)	9	3·51 ± 1·33	21·36 ± 6·81	24·87	0·58 (NS)
Juglandaceae (1/1)	1	5·16	22·41	27·57	—
Krameriaceae (1/1)	1	1·29	15·59	16·88	—
Lamiaceae (Labiatae) (8/12)	14	3·49 ± 1·30	17·09 ± 5·16	20·58	0·01 (NS)
Liliaceae (1/1)	1	1·86	21·08	22·94	—
Loasaceae (3/15)	20	2·29 ± 1·81	20·34 ± 5·34	22·63	−0·23 (NS)
Loganiaceae (1/2)	2	2·34 ± 0·52	21·28 ± 0·67	23·62	—
Malvaceae (2/5)	5	1·76 ± 0·80	13·84 ± 3·11	15·60	—
Martyniaceae (1/2)	2	6·24 ± 3·15	18·56 ± 5·42	24·80	—
Moraceae (Cannabinaceae) (1/1)	1	2·83	15·63	18·46	—
Nyctaginaceae (3/6)	10	2·01 ± 0·67	18·05 ± 4·22	20·06	0·52 (NS)
Oleaceae (2/2)	2	1·79 ± 0·27	27·60 ± 1·62	29·39	—

Onagraceae (4/5)	5	2·39 ± 0·48	17·98 ± 6·18	20·37	—
Papaveraceae (2/5)	6	2·35 ± 0·42	19·41 ± 3·78	21·76	0·35 (NS)
Poaceae (Gramineae) (1/1)	1	2·77	12·98	15·75	—
Polemoniaceae (3/6)	6	2·17 ± 1·05	23·29 ± 2·36	25·46	−0·17 (NS)
Polygonaceae (3/21)	24	1·43 ± 0·43	20·05 ± 4·40	21·48	0·35 (NS)
Ranunculaceae (2/3)	4	2·22 ± 0·38	23·15 ± 3·09	25·37	—
Rhamnaceae (3/4)	5	3·12 ± 1·54	21·47 ± 7·37	24·59	—
Rosaceae (13/18)	31	2·80 ± 0·99	19·81 ± 5·42	22·61	0·27 (NS)
Rubiaceae (1/1)	1	2·20	19·79	21·99	—
Rutaceae (1/1)	1	6·23	21·21	27·44	—
Salicaceae (1/1)	1	1·76	12·98	14·74	—
Santalaceae (1/1)	1	3·33	25·23	28·56	—
Sapindaceae (2/2)	2	3·55 ± 2·63	20·49 ± 1·10	24·04	—
Saururaceae (1/1)	2	2·51 ± 0·42	31·58 ± 0·86	34·09	—
Saxifragaceae (3/8)	9	2·86 ± 1·39	20·04 ± 4·90	22·90	0·12 (NS)
Scrophulariaceae (7/36)	40	1·44 ± 0·76	25·06 ± 5·40	26·50	0·10 (NS)
Solanaceae (5/10)	15	3·42 ± 2·09	18·54 ± 3·42	21·96	−0·32 (NS)
Tamaricaceae (1/3)	3	1·86 ± 0·40	15·80 ± 1·43	17·66	—
Urticaceae (1/1)	1	5·77	10·87	16·64	—
Verbenaceae (3/4)	4	1·73 ± 0·65	15·30 ± 6·12	17·03	—
Vitaceae (1/1)	1	2·31	14·99	17·30	—
Zygophyllaceae (4/4)	5	3·21 ± 1·62	21·61 ± 5·83	24·82	—
Totals: (269/614)	832				

[a] Sample size too small to derive a meaningful correlation ($N \leqslant 5$).
[b] NS = not significantly different from zero at the 5% level ($P = 0{\cdot}05$).

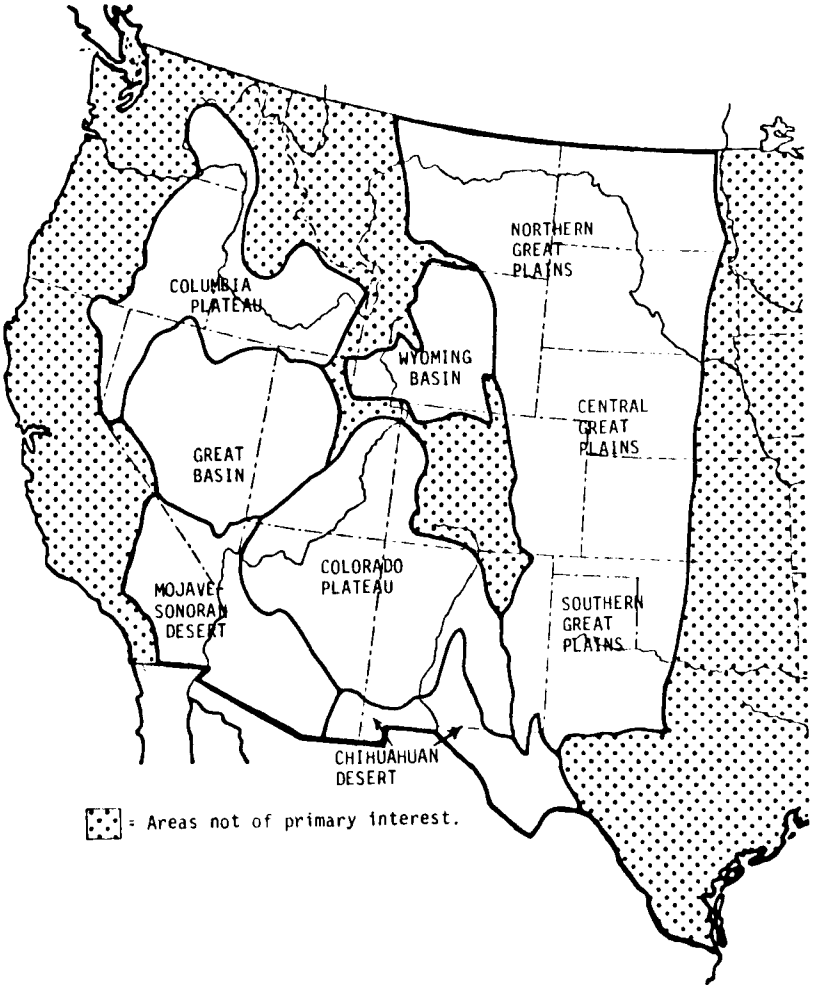

Fig. 1. The major vegetational/geographical regions of the western USA where plants were collected for this survey. Stippled areas were generally outside the scope of this study.

of potentially useful products such as gums, oils, resins, tars, and waxes. Grasses (Poaceae, Gramineae) were given a low priority for collection and screening because this family has been shown to be generally low in yields of extractable compounds of interest.[27] Plants from the forested Rocky Mountains and trees were generally excluded from this survey (see Fig. 1) because they were considered as being beyond the scope of this project. Some shrubs and herbaceous subshrubs such as *Artemisia*,

Chrysothamnus, *Gutierrezia*, and *Atriplex* species were included in this study because of the potential of small woody (and obscurely woody) plants in arid regions such as the Great Basin.

Mounted voucher specimens were prepared for each collection and have been deposited at the USDA, ARS, Northern Regional Research Center, Peoria, Illinois. Plant taxonomic nomenclature and synonymy followed the work of Kartesz and Kartesz.[28] Additional taxonomic information was obtained from the works of Kearney *et al.*, [29] Correll and Johnston,[30] Munz and Keck,[31] Hitchcock and Cronquist,[32] and Arnow *et al.*[33]

Extraction procedures

The methods used generally followed those of Adams and McChesney.[21] Whole aerial (above ground) plant material was dried for 48 h at 70°C. The plant material was then ground in a Wiley® mill to pass a 2 mm mesh screen.

A plug of glass wool was placed in a Whatman paper thimble (33 mm × 94 mm) and both were oven-dried for 48 h at 100°C. To prevent rehydration before pre-weighing, the thimble and glass wool plug were then placed in a desiccator and allowed to cool for at least 4 h.

Disposable 16 oz aluminum pans (Kaiser, no. 1016) were used for evaporation of the solvents from each extraction, but these were found to contain a volatile coating that would contribute a source of error. Therefore, the aluminum pans were pre-baked at 100°C for 24 h, placed in a desiccator, allowed to cool for at least 4 h, and then pre-weighed.

The dry, ground plant material (15–20 g) was placed in a pre-weighed thimble, secured with the corresponding glass wool plug, and tared. The plant material in the thimble was then extracted sequentially, first with hexane for 20 h in a Soxhlet extractor (followed by oven-drying for 4 h at 100°C to remove traces of hexane from the extracted residue), and then with methanol for 20 h in the same extraction apparatus. The extracts were placed in the pre-weighed aluminum pans, and the solvents were evaporated off in an externally-vented oven. Hexane extracts were concentrated at 100°C for 24 h before weighing. Methanol extracts were concentrated at 100°C for 48 h and were then placed in a desiccator and permitted to cool for a minimum of 4 h before weighing. The extraction thimble, glass wool plug, and marc were oven-dried for 48 h at 100°C and placed in a desiccator for at least 4 h before final weighing for gravimetric determination of yields. Although some volatiles were lost in the drying procedures, these would also likely be lost in commercial harvesting and field drying preparation.[14,24]

RESULTS AND DISCUSSION

The results of the survey are shown in Table 1 and the Appendix. By far, the plant family most frequently encountered in this study was the Asteraceae (Compositae), accounting for nearly 42% of the total number of accessions and almost 39% of all of the taxa investigated. The next largest and most represented family (i.e., the Fabaceae or Leguminosae) accounted for only about 5% of the total number of accessions and 6% of the taxa examined in this survey (see Table 1).

Certain analyses of the same taxa from different regions or areas (independently collected by different collaborators) give some index to infra-specific variation (plus environmental variation). Note, for example, that five specimens of *Chrysothamnus nauseosus* ssp. *consimilis* (Asteraceae) (plant nos. 3486, 3488, 3488-1, 3491, 3493), all of which were collected within two days, varied in their yields of hexane-extractables from 8·8% to 11·4% on a dry weight basis (the standard error of extraction was 0·14%). An additional collection of *C. nauseosus* ssp. *consimilis* (plant no. 4387) from Nevada the following year had a nonpolar extract yield of 12·3% (see Appendix). These differences could be due to habitat influences (environmental plasticity), to minor regional variation (i.e. genotypic differences/chemical races), or to a combination of both major factors (environment × genetics). Significant differences in yields of hexane-extractables were also observed in four specimens of *Chrysothamnus nauseosus* ssp. *hololeucus* (plant nos. 3483, 3487, 3490, 3492) collected at the same time in the same general vicinity, which varied from 6·2% to 9·7%. Variation among four collections of *Chrysothamnus paniculatus* (plant nos. 3495, 3496, 3497, 3498) was even greater: these plants, collected across a regional transect on the same day, ranged in yield of nonpolar extractables from 7·0% to 16·4% (see Appendix). These values are comparable to those reported by McLaughlin and Hoffmann for yields of nonpolar 'biocrude'[19] from *C. paniculatus* of 9·7% to 18·3%.[18]

The 15 taxa with the highest yields of hexane-extractables (i.e. over 10% of their dry weight) were *Chrysothamnus paniculatus* (NV, 16·4%), *Parthenium argentatum* (TX, 15·4%), *Chrysothamnus nauseosus* ssp. *consimilis* (NV, 13·2%), *Iva xanthifolia* (WA, 12·6%), *Euphorbia antisyphilitica* (TX, 12·4%), *Chrysothamnus nauseosus* ssp. *graveolens* (CO, 11·9%), *Grindelia squarrosa* (WA, 11·7%), *G. squarrosa* var. *serrulata* (CO, 11·1%), *Mortonia sempervirens* (TX, 10·7%), *Gutierrezia sarothrae* (OR, 10·4%), *Asclepias linaria* (AZ, 10·4%), *Hypericum perforatum* (WA, 10·4%). *Grindelia nana* (WA, 10·4%), *G. acutifolia* (CO, 10·2%), and *G. squarrosa* var. *nuda* (NM, 10·2%) (Appendix). Eleven of these

taxa are in the Asteraceae (Compositae), with one each in the Asclepiadaceae, Celastraceae, Clusiaceae, and Euphorbiaceae. It is interesting to note that two of the highest-yielding species have already been used as commercial sources of industrial raw materials, i.e. the well known guayule plant (*Parthenium argentatum*), as a source of natural rubber,[10,34,35] and candelilla (*Euphorbia antisyphilitica*), as a source of wax.[10,34,36]

The results presented here concur with those of McLaughlin and Hoffmann[18] in that species that are resinous tend to have the highest yields of nonpolar extractable compounds. In addition, the legumes (Fabaceae) were found to be low in nonpolar extractables, although *Psoralea tenuiflora* (CO, 8·9%) was a notable exception which might be worthy of further investigation. However, it is possible that a significant portion of the nonpolar extract of *P. tenuiflora* may consist of hexane-extractable phototoxic furanocoumarins (i.e. psoralens).[37,38]

As reported previously,[21] species of *Rhus* were found to give very large yields of polar material. The 18 taxa with the highest yields of methanol-extractables (i.e. over 32% of their dry weight) were *Stillingia sylvatica* (TX, 43·3%), *Rhus trilobata* (UT, 42·1%), *Senecio multilobatus* (NV, 37·6%), *Geranium viscosissimum* (WA, 37·3%), *Rhus ovata* (AZ, 36·2%), *Arctostaphylos patula* (CO, 35·3%), *Penstemon virgatus* ssp. *asa-grayi* (CO, 34·4%), *Cordylanthus ramosus* (OR, 34·4%), *Saponaria officinalis* (CO, 34·3%), *Geranium fremontii* (ID, 34·0%), *Lactuca serriola* (AZ, 33·8%), *Penstemon strictiformis* (NM, 33·8%), *P. strictus* (NM, 33·7%), *Arctostaphylos pungens* (AZ, 33·6%), *Baccharis bigelovii* (TX, 33·1%), *Arbutus texana* (*TX*, 32·6%), *Senecio fendleri* (CO, 32·5%), and *Anemopsis californica* (CA, 32·2%) (see Appendix). The polar extracts generally consist of simple sugars and other extractable carbohydrates, polar lipids, glycosides, pigments, free amino acids, and various phenolics.[19,24,26] Although the value of the carbohydrates and other polar constituents as fuels or chemical feedstocks is generally low,[19] the tannins of *Rhus* spp. may be of commercial use.[39–43]

The ten plant families with the largest average nonpolar extraction yields were Celastraceae (10·54%, 1 taxon), Fouquieriaceae (7·41%, 1 taxon), Martyniaceae (6·24%, 2 taxa), Rutaceae (6·23%, 1 taxon), Clusiaceae (5·78%, 1 taxon), Urticaceae (5·77%, 1 taxon), Apocynaceae (5·76%, 2 taxa), Juglandaceae (5·16%, 1 taxon), Euphorbiaceae (5·03%, 18 taxa), and Asclepiadaceae (4·97%, 18 taxa) (see Table 1). It should be noted that most of the aforementioned families were represented by only one or two taxa (sometimes re-collected; see Appendix) and that these data may, therefore, not be truly representative of the entire families cited here.

The largest average polar extraction yields occurred in the families Ericaceae (31·70%, 5 taxa), Saururaceae (31·58%, 1 taxon), Anacardiaceae (29·74%, 7 taxa), Bignoniaceae (28·88%, 2 taxa), Oleaceae (27·60%, 2 taxa), Geraniaceae (26·55%, 7 taxa), Santalaceae (25·23%, 1 taxon), Scrophulariaceae (25·06%, 36 taxa), and Caryophyllaceae (24·75%, 3 taxa) (see Table 1). The Anacardiaceae were represented by seven *Rhus* taxa which are known to be copious producers of tannins.[39–43]

Although the sample sizes (number of accessions, N) for most of the plant families were too small to derive meaningful correlations between the nonpolar and polar extraction yields, several families were fairly well represented, i.e. the Asclepiadaceae ($r = -0{\cdot}21$, $N = 24$), Asteraceae ($r = -0{\cdot}02$, $N = 349$), Brassicaceae ($r = 0{\cdot}28$, $N = 21$), Chenopodiaceae ($r = 0{\cdot}33$, $N = 26$), Euphorbiaceae ($r = -0{\cdot}19$, $N = 26$), Fabaceae ($r = -0{\cdot}17$, $N = 44$), Loasaceae ($r = -0{\cdot}23$, $N = 20$), Polygonaceae ($r = 0{\cdot}35$, $N = 24$), Rosaceae ($r = 0{\cdot}27$, $N = 31$), and Scrophulariaceae ($r = 0{\cdot}10$, $N = 40$) (see Table 1). The overall correlation between hexane and methanol extraction yields for the entire survey was $-0{\cdot}08$. None of these r values were significantly different from zero ($P = 0{\cdot}05$). This lack of correlation should not be taken to mean that one could select and breed plants for high yields of both nonpolar and polar compounds, because photosynthesis is usually physiologically limited by aridity in most of these generally xerophytic western species. In addition, the differential allocation of primary and secondary metabolites is not completely understood, and this is an area which needs additional research.

As previously mentioned, the taxa with the largest yields of extractable nonpolar constituents generally belonged to the Asteraceae, although the Asteraceae was not among the 10 highest average yielding families. Due to the large size and representation of the Asteraceae in this survey, it was subdivided into tribes for comparisons (see Table 2). The tribe Astereae had the highest *average* nonpolar extraction yield (5·83%, Table 2). (Although the tribe Vernonieae had the highest nonpolar yield (6·41%), it was represented by only one accession, so this is of questionable significance.) Several tribes yielded averages of about 5%, i.e. Cichorieae (4·76%), Eupatorieae (4·94%), Inuleae (4·94%), and Mutisieae (5·04%). Noticeably low in yield were the Senecioneae (2·34%) and the Helenieae (2·61%). In general, the average yields of polar (methanol-extractable) constituents were very modest in the Asteraceae, ranging from 14·57% to 21·79%, with most of the tribes being in the 15% to 18% range (see Table 2). The correlations between the yields of nonpolar and polar extractables were generally very low, and were not

TABLE 2

Average Yields of Nonpolar (Hexane-Extractable) and Polar (Methanol-Extractable) Plant Constituents, Average Total Yields, and Inter-correlation Between Nonpolar and Polar Extract Yields by Tribes in the Asteraceae

Tribe (no. genera/no. taxa)	*Number of accessions, N*	*Average hexane % ± SD*	*Average MeOH % ± SD*	*Average total %*	*Hexane–MeOH% correlation coefficient, r*
Anthemideae (6/19)	29	3·90 ± 1·33	17·88 ± 3.60	21·78	0.26 (NS)[a]
Astereae (19/76)	128	5·83 ± 3·33	17·45 ± 4.52	23·28	0·01 (NS)
Cichorieae (Lactuceae) (7/12)	25	4·76 ± 1·45	19·22 ± 5·74	23·98	0·06 (NS)
Cynareae (Cardueae) (4/10)	12	3·55 ± 0·98	15·91 ± 2·37	19·46	0·16 (NS)
Eupatorieae (1/4)	4	4·94 ± 1·93	14·77 ± 4·98	19·71	—[b]
Helenieae (Tageteae) (15/29)	35	2·61 ± 1·05	16·63 ± 4·49	19·24	0.43[c]
Heliantheae (23/53)	74	4·35 ± 2·86	15·98 ± 4·44	20·33	−0·13 (NS)
Inuleae (2/2)	2	4·94 ± 1·28	14·57 ± 1·48	19·51	—
Mutisieae (1/1)	2	5·04 ± 3·19	17·36 ± 2·30	22·40	—
Senecioneae (3/30)	37	2·34 ± 0·72	20·39 ± 6·91	22·73	−0·20 (NS)
Vernonieae (1/1)	1	6.41	21·79	28·20	—
Totals: (82/237)	349				

[a] NS = not significantly different from zero at the 5% level ($P = 0·05$).
[b] Sample size too small to derive a meaningful correlation ($N \leqslant 5$).
[c] Significantly different from zero; 95% confidence limits = 0·11, 0·67.

significantly different from zero, except in the case of the Helenieae ($N = 35$, $r = 0{\cdot}43$, 95% confidence limits = 0·11, 0·67) (see Table 2).

Clearly, the results of this survey concur with the observations of McLaughlin and Hoffmann[18] in that the taxa with the highest yields of extractable nonpolar constituents were either resinous (mostly Asteraceae) or latex-bearing species (Apocynaceae, Asclepiadaceae, Euphorbiaceae). In order to evaluate the economic potential of these plants, additional research is currently being conducted to characterize the nonpolar constituents of the highest-yielding taxa.

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APPENDIX

YIELDS OF PLANTS SCREENED (1981–84) ((R) DENOTES RECOLLECTED PLANT SPECIES; (2ND) DENOTES SECOND (REPEAT) ANALYSIS)

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Agavaceae	*Agave lecheguilla* Torr.	Lechuguilla	TX	2.46	22.04	24.50	3560
	Dasylirion leiophyllum Engelm.	Smooth sotol	TX	5.53	22.20	27.73	3562
	Yucca baileyi Woot. & Standl.	Yucca	CO	1.65	19.10	20.75	4491
	Yucca elata Engelm.	Soaptree Yucca	TX	4.42	27.91	32.33	3565

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Amaranthaceae	Amaranthus arenicola I.M. Johnston	Sandhills amaranth	CO	1.37	14.05	15.42	4274
	Amaranthus graecizans L.	Tumbleweed pigweed	OR	1.59	16.97	18.56	4444
	Amaranthus powellii S. Wats.	Powell's amaranth	ID	1.68	7.53	9.21	4411
	Amaranthus retroflexus L.	Redroot pigweed	CO	1.30	14.00	15.30	4273
	Amaranthus retroflexus L.	Redroot pigweed	ID	1.76	10.96	12.72	4388
	Tidestromia lanuginosa (Nutt.) Standl.	Wooly tidestromia	AZ	1.43	28.28	29.71	5636
	Tidestromia suffruticosa (Torr.) Standl.	Shrubby tidestromia	TX	0.87	14.96	15.83	5188
Anacardiaceae	Rhus glabra L.	Smooth sumac	CO	8.65	31.51	40.16	4332
	Rhus glabra L.	Smooth sumac	CO	5.73	29.25	34.98	5250(R)
	Rhus microphylla Engelm. ex Gray	Littleleaf sumac	TX	3.25	27.12	30.37	5199
	khus ovata S. Wats.	Sugar bush	AZ	3.87	36.20	40.07	5287
	Rhus trilobata (Nutt.) Gray	Skunkbush	UT	2.74	18.24	20.98	3917
	Rhus trilobata (Nutt.) Gray	Skunkbush	UT	2.49	42.13	44.62	3150
	Rhus trilobata (Nutt.) Gray	Skunkbush	CO	3.68	29.54	33.22	4410
	Rhus trilobata (Nutt.) Gray	Skunkbush	CO	7.34	30.15	37.49	4743(R)
	Rhus trilobata var. pilosissima Engl.	Skunkbush	TX	4.33	26.26	30.59	5203
	Rhus trilobata var. simplicifolia (Greene) Barkley	Skunkbush	CO	2.91	28.02	30.93	4001
	Rhus virens Lindheimer ex Gray	Evergreen sumac	TX	4.72	28.75	33.47	4089
Apiaceae	Anthriscus caucalis Bieb.	Bur-chervil	WA	1.48	23.46	24.94	3934
	Conium maculatum L.	Poison hemlock	CO	1.67	14.14	15.81	4390
	Eryngium heterophyllum Engelm.	Mexican thistle	TX	2.13	14.58	16.71	4731
	Lomatium dissectum var. multifidum (Nutt.) M.& C.	Indian parsley	WA	5.72	29.87	35.59	3966
	Lomatium dissectum var. multifidum (Nutt.) M.& C.	Indian parsley	WA	4.62	21.11	25.73	4691(R)
	Lomatium grayi Coult. & Rose	Narrowleaf lomatium	WA	2.88	23.13	26.01	3933
	Lomatium simplex (Nutt.) Macbr.	Nineleaf biscuitroot	CO	2.37	19.51	21.88	5574
Apocynaceae	Apocynum androsaemifolium L.	Spreading dogbane	CO	6.28	24.15	30.43	4408
	Apocynum cannabinum L.	Indian hemp	WY	5.23	18.78	24.01	4284
Asclepiadaceae	Asclepias arenaria Torr.	Sand milkweed	KS	5.85	17.57	23.42	5278
	Asclepias asperula (Dcne.) Woods.	Creeping milkweed	AZ	3.46	21.39	24.85	4017
	Asclepias asperula ssp. capricornu (Woods.) Woods.	Capricorn milkweed	CO	2.80	25.10	27.90	3983
	Asclepias brachystephana Engelm. ex Torr.	Shortcrown milkweed	TX	8.13	17.19	25.32	4083
	Asclepias brachystephana Engelm. ex Torr.	Shortcrown milkweed	TX	5.89	19.87	25.76	4734(R)
	Asclepias cryptoceras S. Wats.	Pallid milkweed	CO	3.94	30.49	34.43	3995
	Asclepias cryptoceras S. Wats.	Pallid milkweed	CO	1.67	13.45	15.12	5238(R)
	Asclepias erosa Torr.	Desert milkweed	AZ	6.01	14.90	20.91	4031
	Asclepias hallii Gray	Hall's milkweed	CO	1.27	20.33	21.60	4750
	Asclepias incarnata L.	Swamp milkweed	CO	4.59	19.65	24.24	4347
	Asclepias labriformis M.E. Jones	Milkweed	UT	4.98	20.50	25.48	4654

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Asclepiadaceae	Asclepias latifolia Raf.	Broadleaf milkweed	CO	6.19	15.17	21.36	4235
	Asclepias linaria Cav.	Milkweed	AZ	10.40	17.81	28.21	4097
	Asclepias oenotheroides Cham. & Schlecht.	Milkweed	TX	4.40	25.70	30.10	5190
	Asclepias ovalifolia Dcne.	Oval-leaved milkweed	KS	6.22	13.91	20.13	5279
	Asclepias speciosa Torr.	Showy milkweed	NV	7.39	13.88	21.27	3891
	Asclepias speciosa Torr.	Showy milkweed	WA	3.67	10.91	14.58	4438
	Asclepias subulata Dcne.	Skeleton milkweed	AZ	7.19	17.81	25.00	4016
	Asclepias subverticillata (Gray) Vail	Whorled milkweed	AZ	4.09	16.89	20.98	4111
	Asclepias subverticillata (Gray) Vail	Whorled milkweed	CO	3.81	19.55	23.36	4270
	Asclepias subverticillata (Gray) Vail	Whorled milkweed	CO	4.27	16.57	20.84	4604
	Asclepias tuberosa ssp. interior Woodson	Butterfly milkweed	CO	4.86	20.43	25.29	5286
	Asclepias tuberosa ssp. interior Woodson	Butterfly milkweed	CO	2.13	16.62	18.75	5576
	Sarcostemma cynanchoides ssp. hartwegii (Vail) Holm.	Climbing milkweed	AZ	6.04	18.36	24.40	5131
Asteraceae	Acamptopappus sphaerocephalus (Harv. & Gray) Gray	Rayless goldenhead	NV	1.91	14.45	16.36	4704
	Achillea millefolium L.	Common yarrow	MT	2.26	16.50	18.76	4389
	Achillea millefolium var. alpicola (Rydb.) Garrett	Common yarrow	WA	1.93	15.99	17.92	3954
	Achillea millefolium var. lanulosa (Nutt.) Piper	Common yarrow	OR	3.92	15.39	19.31	3407
	Ambrosia ambrosioides (Cav.) Payne	Bur-sage; ragweed	AZ	2.69	12.20	14.89	4159
	Ambrosia artemisiifolia L.	Common ragweed	ID	2.78	14.94	17.72	5299
	Ambrosia chamissonis (Less.) Greene	Ragweed	CA	2.49	22.56	25.05	5230
	Ambrosia confertiflora DC.	Ragweed	AZ	2.67	17.15	19.82	5613
	Ambrosia confertiflora DC.	Ragweed	TX	2.56	16.45	19.01	5208
	Ambrosia coronopifolia Torr. & Gray	Western ragweed	CO	5.12	16.07	21.19	4351
	Ambrosia deltoidea (Torr.) Payne	Ragweed	AZ	8.55	18.02	26.57	4161
	Ambrosia deltoidea (Torr.) Payne	Ragweed	AZ	3.09	10.70	13.79	5140(R)
	Ambrosia dumosa (Gray) Payne	White bur-sage	NV	1.98	12.72	14.70	3884
	Ambrosia eriocentra (Gray) Payne	Wooly bur-sage	NV	1.66	11.99	13.65	3911
	Ambrosia psilostachya DC.	Western ragweed	UT	3.88	18.11	21.99	3478
	Ambrosia psilostachya DC.	Western ragweed	AZ	5.10	14.33	19.43	4112
	Ambrosia trifida L.	Giant ragweed	CO	1.41	9.81	11.22	4342
	Amphiachyris dracunculoides (DC.) Nutt.	Common broomweed	TX	5.97	14.83	20.80	3568
	Anthemis cotula L.	Dogfennel	ID	5.17	18.50	23.67	4371
	Anthemis cotula L.	Dogfennel	ID	7.04	13.87	20.91	4412
	Arctium minus Bernh.	Smaller burdock	CO	4.68	15.53	20.21	4609
	Arctium minus Bernh.	Smaller burdock	NM	3.72	17.66	21.38	4401
	Artemisia absinthium L.	Common wormwood	WA	5.97	19.20	25.17	4445

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Asteraceae	Artemisia arbuscula Nutt.	Low sagebrush	CO	3.37	23.19	26.56	4614
	Artemisia cana Pursh	Silver sagebrush	ND	1.51	13.33	14.84	4568
	Artemisia dracunculus L.	Tarragon sagebrush	ID	3.62	14.87	18.49	4380
	Artemisia dracunculus L.	Tarragon sagebrush	WA	3.80	23.79	27.59	4451
	Artemisia filifolia Torr.	Sand sagebrush	CO	3.77	20.23	24.00	4330
	Artemisia filifolia Torr.	Sand sagebrush	TX	3.92	16.56	20.48	4082
	Artemisia ludoviciana Nutt.	White sagebrush	CO	4.51	15.99	20.50	4324
	Artemisia ludoviciana Nutt.	White sagebrush	ID	2.90	16.56	19.46	4378
	Artemisia ludoviciana Nutt.	White sagebrush	TX	4.68	11.24	15.92	3567
	Artemisia ludoviciana ssp. candicans (Rydb.) Keck	White sagebrush	ID	4.08	14.99	19.07	4386
	Artemisia rigida (Nutt.) Gray	Stiff sagebrush	WA	2.08	17.26	19.34	3936
	Artemisia spinescens D.C. Eaton	Bud sagebrush	UT	4.49	21.93	26.42	3921
	Artemisia tridentata Nutt.	Big sagebrush	CO	5.48	20.35	25.83	4549
	Artemisia tridentata Nutt.	Big sagebrush	ID	2.69	19.91	22.60	4362
	Artemisia tridentata Nutt.	Big sagebrush	NV	3.87	19.71	23.58	3484
	Artemisia tridentata Nutt.	Big sagebrush	OR	6.41	26.63	33.04	4442
	Artemisia tridentata ssp. wyomingensis Beet. & You.	Wyoming big sagebrush	NV	3.50	13.90	17.40	4367
	Artemisia tripartita Rydb.	Three-tip sagebrush	CO	4.92	18.53	23.45	4600
	Artemisia tripartita Rydb.	Three-tip sagebrush	OR	2.99	16.44	19.43	3405
	Aster chilensis Nees	Everywhere aster	ID	2.36	16.61	18.97	4366
	Aster ericoides ssp. pansus (Blake) A.G. Jones	Heath aster	CO	2.53	17.85	20.38	4329
	Aster fendleri Gray	Fendler's aster	CO	2.13	18.35	20.48	4536
	Aster hesperius Gray	Siskiyou aster	CO	1.62	14.59	16.21	4544
	Aster laevis L.	Smooth aster	ND	1.51	14.99	16.50	4572
	Baccharis bigelovii Gray	Bigelow's baccharis	TX	4.24	33.07	37.31	5202
	Baccharis pilularis DC.	Groundsel tree	CA	2.58	16.70	19.28	5232
	Baccharis pteronioides DC.	Yerba de pasmo	AZ	4.27	22.93	27.20	4029
	Baccharis salicifolia (Ruiz & Pavon) Pers.	Groundsel tree	TX	5.26	17.78	23.04	3552
	Baccharis salicina Torr. & Gray	Groundsel tree	TX	3.05	25.21	28.26	5217
	Baccharis sarothroides Gray	Rosin bush	AZ	7.71	24.20	31.91	4165
	Baccharis sarothroides Gray	Rosin bush	AZ	8.80	24.66	33.46	5619(R)
	Bahia dissecta (Gray) Britton	Ragleaf bahia	CO	2.75	23.13	25.88	4350
	Bahia dissecta (Gray) Britton	Ragleaf bahia	UT	2.77	18.29	21.06	4598
	Baileya multiradiata Harvey & Gray ex Torr.	Desert marigold	TX	2.78	17.22	20.00	4093
	Baileya multiradiata Harvey & Gray ex Torr.	Desert marigold	AZ	2.74	10.68	13.42	4137
	Balsamorhiza careyana Gray	Balsamroot	WA	3.10	17.10	20.20	3951
	Balsamorhiza sagittata (Pursh) Nutt.	Arrowleaf balsamroot	NV	4.93	16.73	21.66	3867
	Balsamorhiza sagittata (Pursh) Nutt.	Arrowleaf balsamroot	WA	5.29	19.34	24.63	3938
	Bebbia juncea (Benth.) Greene	Rush bebbia	AZ	3.21	12.17	15.38	4162

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Asteraceae	Berlandiera lyrata Benth.	Green-eyes	TX	3.12	19.98	23.10	5197
	Brickellia chlorolepis (Woot. & Standl.) Shinners	Brickellbush	AZ	7.12	22.17	29.29	5134
	Brickellia incana Gray	White brickellbush	AZ	3.04	12.82	15.86	4094
	Brickellia laciniata Gray	Cutleaf brickellbush	TX	5.98	12.78	18.76	3576
	Brickellia oblongifolia var. linifolia (Eat.) Robins.	Mohave brickellbush	CO	3.62	11.32	14.94	4510
	Carduus nutans L.	Musk thistle	CO	3.15	17.08	20.23	4233
	Centaurea maculosa Lam.	Knapweed	NV	2.53	11.78	14.31	3485
	Centaurea melitensis L.	Malta star-thistle	TX	2.68	13.00	15.68	4043
	Centaurea repens L.	Russian knapweed	CO	3.08	19.25	22.33	4506
	Centaurea solstitialis L.	Diffuse knapweed	CO	1.77	15.41	17.18	4338
	Chaenactis carphoclinia Gray	Dusty-maiden	AZ	3.01	26.13	29.14	5155
	Chrysanthemum segetum L.	Corn chrysanthemum	CA	4.38	16.05	20.43	5228
	Chrysothamnus linifolius Greene	Spreading rabbitbrush	UT	3.09	16.66	19.75	4591
	Chrysothamnus nauseosus ssp. albicaulis (Nutt.) H. & C.	Rubber rabbitbrush	OR	5.47	23.24	28.71	3408
	Chrysothamnus nauseosus ssp. albicaulis (Nutt.) H. & C.	Rubber rabbitbrush	ID	2.26	13.09	15.35	4384
	Chrysothamnus nauseosus ssp. albicaulis (Nutt.) H. & C.	Rubber rabbitbrush	OR	6.96	25.98	32.94	4443
	Chrysothamnus nauseosus ssp. consimilis (Greene) Hall & Clements	Rubber rabbitbrush	UT	3.79	23.79	27.58	3499
	Chrysothamnus nauseosus ssp. consimilis (Greene) H. & C.	Rubber rabbitbrush	NV	9.73	11.97	21.70	3486
	Chrysothamnus nauseosus ssp. consimilis (Greene) H. & C.	Rubber rabbitbrush	CA	8.82	10.18	19.00	3488
	Chrysothamnus nauseosus ssp. consimilis (Greene) H. & C.	Rubber rabbitbrush	CA	11.40	12.53	23.93	3488-1
	Chrysothamnus nauseosus ssp. consimilis (Greene) H. & C.	Rubber rabbitbrush	CA	11.27	9.91	21.18	3491
	Chrysothamnus nauseosus ssp. consimilis (Greene) H. & C.	Rubber rabbitbrush	CA	10.17	13.06	23.23	3493
	Chrysothamnus nauseosus ssp. consimilis (Greene) H. & C.	Rubber rabbitbrush	NV	12.32	13.31	25.63	4387
	Chrysothamnus nauseosus ssp. consimilis (Greene) H. & C.	Rubber rabbitbrush	NV	13.23	15.93	29.16	5122(R)
	Chrysothamnus nauseosus ssp. graveolens (Nutt.) Piper	Rubber rabbitbrush	NM	8.14	18.82	26.96	4398
	Chrysothamnus nauseosus ssp. graveolens (Nutt.) Piper	Rubber rabbitbrush	CO	11.87	13.04	24.91	4547
	Chrysothamnus nauseosus ssp. graveolens (Nutt.) Piper	Rubber rabbitbrush	CO	9.10	19.00	28.10	5606(R)
	Chrysothamnus nauseosus ssp. hololeucus (Gray) H. & C.	Rubber rabbitbrush	NV	6.27	15.09	21.36	3483
	Chrysothamnus nauseosus ssp. hololeucus (Gray) H. & C.	Rubber rabbitbrush	NV	9.12	16.42	25.54	3487
	Chrysothamnus nauseosus ssp. hololeucus (Gray) H. & C.	Rubber rabbitbrush	CA	9.74	18.51	28.25	3490
	Chrysothamnus nauseosus ssp. hololeucus (Gray) H. & C.	Rubber rabbitbrush	CA	9.28	17.54	26.82	5763(R)
	Chrysothamnus nauseosus ssp. hololeucus (Gray) H. & C.	Rubber rabbitbrush	CA	6.15	16.75	22.90	3492
	Chrysothamnus nauseosus ssp. pinifolius (Gre.) H. & C.	Rubber rabbitbrush	CO	7.36	20.60	27.96	5638
	Chrysothamnus paniculatus (Gray) Hall	Rabbitbrush	NV	9.40	19.08	28.48	3497

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Asteraceae	Chrysothamnus paniculatus (Gray) Hall	Rabbitbrush	NV	16.36	20.89	37.25	3496
	Chrysothamnus paniculatus (Gray) Hall	Rabbitbrush	NV	13.82	15.13	28.95	5762(R)
	Chrysothamnus paniculatus (Gray) Hall	Rabbitbrush	AZ	10.45	16.58	27.03	3498
	Chrysothamnus paniculatus (Gray) Hall	Rabbitbrush	CA	7.03	15.11	22.14	3495
	Chrysothamnus parryi (Gray) Greene	Parry's rabbitbrush	CO	5.58	20.80	26.38	5260
	Chrysothamnus parryi (Gray) Greene	Parry's rabbitbrush	CO	3.61	16.20	19.81	5640
	Chrysothamnus teretifolius (Dur. & Hilg.) Hall	Roundleaf rabbitbrush	CA	8.57	18.81	27.38	3489
	Chrysothamnus teretifolius (Dur. & Hilg.) Hall	Roundleaf rabbitbrush	CA	7.09	19.35	26.44	5764(R)
	Chrysothamnus vaseyi (Gray) Greene	Vasey's rabbitbrush	CO	6.12	17.49	23.61	4612
	Chrysothamnus viscidiflorus (Hook.) Nutt.	Stickyleaf rabbitbrush	NV	2.28	16.44	18.72	4358
	Chrysothamnus viscidiflorus (Hook.) Nutt.	Stickyleaf rabbitbrush	OR	8.48	28.16	36.64	4418
	Chrysothamnus viscidiflorus (Hook.) Nutt.	Stickyleaf rabbitbrush	ID	3.33	21.80	25.13	4359
	Chrysothamnus viscidiflorus (Hook.) Nutt.	Stickyleaf rabbitbrush	WA	4.39	26.89	31.28	4440
	Chrysothamnus viscidiflorus (Hook.) Nutt.	Stickyleaf rabbitbrush	OR	3.15	29.38	32.53	4439
	Chrysothamnus viscidiflorus (Hook.) Nutt.	Stickyleaf rabbitbrush	OR	0.75	11.13	11.88	5223(R)
	Chrysothamnus viscidiflorus ssp. lanceolatus (Nutt.) H. & C.	Stickyleaf rabbitbrush	WY	2.77	19.44	22.21	5262
	Chrysothamnus viscidiflorus ssp. puberulus (Eat.) H. & C.	Stickyleaf rabbitbrush	MT	1.92	13.36	15.28	4374
	Cichorium intybus L.	Wild chicory	NE	2.43	14.63	17.06	4283
	Cichorium intybus L.	Wild chicory	WA	3.34	8.64	11.98	4433
	Cichorium intybus L.	Wild chicory	OR	4.29	11.90	16.19	4415
	Cirsium arvense (L.) Scop.	Canadian thistle	NV	4.76	17.54	22.30	4373
	Cirsium drummondii Torr. & Gray	Elk thistle	SD	4.20	17.12	21.32	4574
	Cirsium undulatum (Nutt.) Spreng.	Wavyleaf thistle	TX	4.13	17.37	21.50	4042
	Cirsium vulgare (Savi) Tenore	Bull thistle	CO	3.08	16.91	19.99	4327
	Cirsium vulgare (Savi) Tenore	Bull thistle	ID	4.77	12.31	17.08	4372
	Conyza canadensis (L.) Cronq.	Horseweed	ID	2.13	16.63	18.76	4414
	Conyza canadensis (L.) Cronq.	Horseweed	OR	2.24	18.64	20.88	4420
	Conyza canadensis (L.) Cronq.	Horseweed	CO	1.88	11.90	13.78	4285
	Crepis acuminata Nutt.	Tapertip hawksbeard	NV	3.50	23.33	26.83	4697
	Crepis intermedia Gray	Gray hawksbeard	NV	3.16	26.23	29.39	3880
	Crepis intermedia Gray	Gray hawksbeard	UT	2.39	9.83	12.22	3919
	Dugaldia hoopesii (Gray) Rydb.	Orange sneezeweed	UT	2.54	14.77	17.31	4602
	Dyssodia acerosa DC.	Prickleaf dogweed	AZ	1.13	6.85	7.98	5151
	Dyssodia acerosa DC.	Prickleaf dogweed	TX	2.15	16.90	19.05	5207
	Dyssodia cooperi Gray	Cooper's dogweed	NV	0.75	9.85	10.60	4104

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Asteraceae	Dyssodia papposa (Vent.) Hitchc.	Dogweed	CO	3.10	19.94	23.04	4340
	Dyssodia pentachaeta var. belenidium (DC.) Stroth.	Dogweed	NV	2.96	17.19	20.15	4717
	Encelia farinosa Gray ex Torr.	Brittle-bush	AZ	7.32	14.14	21.46	4160
	Encelia frutescens (Gray) Gray	Bush encelia	NV	2.57	11.78	14.34	3901
	Encelia frutescens (Gray) Gray	Bush encelia	CA	1.91	11.64	13.55	3905
	Encelia virginiensis A. Nels.	Virginia encelia	CA	3.13	16.91	20.04	4106
	Engelmannia pinnatifida Gray ex Nutt.	Engelmann's daisy	TX	1.99	23.98	25.97	4037
	Ericameria laricifolia (Gray) Shinners	Turpentine brush; Goldenweed	AZ	3.32	18.30	21.62	4164
	Ericameria linearifolia (DC.) Urb. & Wuss.	Narrowleaf goldenweed	AZ	5.73	26.03	31.76	4033
	Ericameria linearifolia (DC.) Urb. & Wuss.	Narrowleaf goldenweed	AZ	6.12	20.82	26.94	5621
	Ericameria nana Nutt.	Baby goldenweed	CA	4.35	18.82	23.17	4706
	Erigeron divergens Torr. & Gray	Spreading fleabane	AZ	1.03	18.86	19.89	5128
	Erigeron filifolius (Hook.) Nutt.	Threadleaf fleabane	OR	2.60	17.23	19.83	3403
	Euthamia occidentalis Nutt.	Western goldenrod	NV	3.03	20.34	23.37	5119
	Euthamia occidentalis Nutt.	Western goldenrod	WA	2.48	18.41	20.89	5304
	Flaveria chlorifolia Gray	Clasping flaveria	TX	2.63	12.54	15.17	3575
	Flaveria trinervia (Spreng.) Mohr		AZ	3.53	14.67	18.20	5770
	Flourensia cernua DC.	Tarbush; Blackbrush	TX	8.08	20.71	28.79	3578
	Flourensia cernua DC.	Tarbush; Blackbrush	TX	8.24	23.00	31.24	4741(R)
	Gaillardia arizonica Gray	Blanket flower	AZ	3.64	23.70	27.34	5129
	Gaillardia pinnatifida Torr.	Blanket flower	AZ	1.18	10.91	12.09	5622
	Geraea canescens Torr. & Gray	Desert gold	AZ	2.38	28.28	30.66	5148
	Geraea canescens Torr. & Gray	Desert gold	NV	4.46	18.17	22.63	4722
	Gnaphalium chilense Spreng.	Cotton-batting cudweed	TX	4.04	13.52	17.56	3569
	Grindelia acutifolia Steyermark	Gumweed	CO	5.10	12.86	17.96	4288
	Grindelia acutifolia Steyermark	Gumweed	CO	10.23	16.20	26.43	4403
	Grindelia aphanactis Rydb.	Gumweed	NM	7.95	17.99	25.94	5271
	Grindelia arizonica var. stenophylla Steyermark	Arizona gumweed	CO	8.36	17.13	25.49	5282
	Grindelia decumbens Greene	Gumweed	CO	7.11	14.02	21.13	5643
	Grindelia fastigiata Greene	Gumweed	CO	9.62	13.07	22.69	4594
	Grindelia fastigiata Greene	Gumweed	CO	7.47	16.13	23.60	5608(R)
	Grindelia nana Nutt.	Low gumweed; baby gumweed	WA	10.36	18.60	28.96	5236
	Grindelia squarrosa (Pursh) Dunal	Curly-cup gumweed	ND	9.65	13.26	22.91	4573
	Grindelia squarrosa (Pursh) Dunal	Curly-cup gumweed	WA	11.67	13.34	25.01	4436
	Grindelia squarrosa (Pursh) Dunal	Curly-cup gumweed	WA	9.04	19.02	28.06	5296(R)
	Grindelia squarrosa var. nuda (Wood) Gray	Curly-cup gumweed	NM	10.23	16.47	26.70	5277

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Asteraceae	Grindelia squarrosa var. quasiperennis Lunell	Curly-cup gumweed	CO	7.16	18.02	25.18	5259
	Grindelia squarrosa var. serrulata (Rydb.) Steyer.	Curly-cup gumweed	CO	11.12	16.93	28.05	4279
	Grindelia squarrosa var. serrulata (Rydb.) Steyer.	Curly-cup gumweed	CO	9.13	14.54	23.67	5275(R)
	Grindelia squarrosa var. serrulata (Rydb.) Steyer.	Curly-cup gumweed	CO	10.65	13.65	24.30	4540
	Grindelia subalpina var. erecta (Nels.) Steyermark	Gumweed	CO	8.62	18.33	26.95	5253
	Gutierrezia microcephala (DC.) Gray	Threadleaf snakeweed	CO	8.99	13.02	22.01	4294
	Gutierrezia microcephala (DC.) Gray	Threadleaf snakeweed	CO	5.34	14.20	19.54	4742(R)
	Gutierrezia microcephala (DC.) Gray	Threadleaf snakeweed	UT	8.21	15.31	23.52	4603
	Gutierrezia sarothrae (Pursh) Britt. & Rusby	Broom snakeweed	UT	5.82	16.06	21.88	4593
	Gutierrezia sarothrae (Pursh) Britt. & Rusby	Broom snakeweed	OR	10.45	20.23	30.68	4416
	Gutierrezia sarothrae (Pursh) Britt. & Rusby	Broom snakeweed	OR	6.64	15.38	22.02	5331(R)
	Gutierrezia sarothrae (Pursh) Britt. & Rusby	Broom snakeweed	AZ	7.55	20.87	28.42	4101
	Gymnosperma glutinosum (Spreng.) Less.	Tatalencho	TX	4.52	14.11	18.63	3580
	Haploesthes greggii Gray	False broomweed	TX	3.85	15.35	19.20	4124
	Haplopappus acradenius (Greene) Blake	Goldenweed	AZ	9.60	22.22	31.82	4114
	Haplopappus acradenius (Greene) Blake	Goldenweed	AZ	5.22	17.64	22.86	5627(R)
	Haplopappus armerioides (Nutt.) Gray	Thrifty goldenweed	CO	2.46	8.96	11.42	3994
	Haplopappus tenuisectus (Greene) Blake	Burro-weed	AZ	4.47	13.94	18.41	5628
	Helianthus annuus L.	Common sunflower	ID	8.71	12.60	21.31	4421
	Helianthus annuus L.	Common sunflower	ID	9.39	15.45	24.84	5297(R)
	Helianthus annuus L.	Common sunflower	CO	5.73	11.30	17.03	4333
	Helianthus laciniatus Gray	Sunflower	TX	3.81	17.70	21.51	5193
	Helianthus niveus (Benth.) Brandeg.	Sunflower	AZ	5.29	13.75	19.04	4167
	Helianthus nuttallii Torr. & Gray	Nuttall's sunflower	CO	4.15	8.22	12.37	4534
	Helianthus petiolaris Nutt.	Prairie sunflower	CO	2.31	22.36	24.67	4355
	Helianthus petiolaris Nutt.	Prairie sunflower	ID	5.35	10.31	15.66	4361
	Helianthus petiolaris ssp. fallax Heiser	Prairie sunflower	NV	3.66	18.91	22.57	3879
	Helianthus pumilus Nutt.	Sunflower	WY	4.68	12.11	16.79	4277
	Hemizonia fitchii Gray	Fitch's spikeweed; Tarweed	CA	4.94	16.38	21.32	3383
	Heterotheca subaxillaris (Lam.) Britt. & Rusby	Camphor weed	AZ	5.78	16.58	22.36	4133
	Heterotheca villosa var. foliosa (Nutt.) Harms	Hairy golden aster	AZ	2.18	11.55	13.73	4120
	Heterotheca villosa var. foliosa (Nutt.) Harms	Hairy golden aster	CO	1.65	8.88	10.53	4543
	Heterotheca villosa var. hispida (Hook.) Harms	Hairy golden aster	AZ	1.50	10.47	11.97	5170

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Asteraceae	Heterotheca villosa var. hispida (Hook.) Harms	Hairy golden aster	CO	2.09	11.10	13.19	4499
	Hymenoclea monogyra Torr. & Gray	Burrobrush	TX	4.31	18.74	23.05	3573
	Hymenoclea salsola Torr. & Gray	White burrobrush	AZ	1.96	18.67	20.63	5624
	Hymenopappus filifolius Hook.	Fineleaf wooly-white	SD	1.11	9.59	10.70	4569
	Hymenopappus filifolius Hook.	Fineleaf wooly-white	WA	2.01	20.94	22.95	3950
	Hymenopappus filifolius var. lugens (Greene) Jeps.	Fineleaf wooly-white	UT	3.68	18.15	21.83	4498
	Hymenopappus filifolius var. pauciflorus (Johnst.) Turner	Fineleaf wooly-white	AZ	3.64	18.16	21.80	4098
	Hymenopappus filifolius var. pauciflorus (Johnst.) Turner	Fineleaf wooly-white	UT	4.97	15.27	20.24	3873
	Hymenopappus flavescens var. cano-tomentosus Gray	Yellow wooly-white	TX	2.43	22.50	24.93	4041
	Hymenothrix wislizenii Gray		AZ	1.70	23.37	25.07	5625
	Hymenothrix wrightii Gray		AZ	1.78	13.84	15.62	5626
	Hymenoxys acaulis (Pursh) Parker	Stemless bitterweed	AZ	1.94	18.13	20.07	5139
	Hymenoxys cooperi (Gray) Cockerell	Cooper's bitterweed	AZ	1.23	18.48	19.71	5149
	Hymenoxys richardsonii (Hook.) Cockerell	Pingue bitterweed	CO	3.65	14.93	18.58	4325
	Hymenoxys richardsonii var. floribunda (Gray) Park.	Pingue bitterweed	AZ	2.02	14.12	16.14	5138
	Isocoma wrightii (Gray) Rydb.	Jimmy-weed	TX	1.90	13.84	15.74	4738
	Iva acerosa (Nutt.) Jackson	Prickly oxytenia; Sumpweed	UT	3.52	14.03	17.55	4606
	Iva axillaris Pursh	Poverty sumpweed	OR	6.41	19.90	26.31	4448
	Iva dealbata Gray	Wooly sumpweed	TX	2.49	17.09	19.58	5185
	Iva xanthifolia Nutt.	Rag sumpweed	CO	4.58	14.22	18.80	4289
	Iva xanthifolia Nutt.	Rag sumpweed	WA	12.64	13.14	25.78	4450
	Iva xanthifolia Nutt.	Rag sumpweed	WA	2.13	19.44	21.57	5233(R)
	Lactuca serriola L.	Prickly lettuce	AZ	4.48	33.77	38.25	4121
	Lactuca serriola L.	Prickly lettuce	CO	6.26	19.16	25.42	4396
	Lactuca serriola L.	Prickly lettuce	NC	3.76	16.03	19.79	3149
	Lactuca serriola L.	Prickly lettuce	WA	6.71	17.02	23.73	4453
	Lactuca tatarica ssp. pulchella (Pursh) Stebbins	Blue lettuce	CO	7.61	23.16	30.77	4293
	Lactuca tatarica ssp. pulchella (Pursh) Stebbins	Blue lettuce	CO	6.76	17.57	24.33	4745(R)
	Machaeranthera canescens (Pursh) Gray	Hoary tansyaster	ID	3.96	22.94	26.90	4383
	Machaeranthera gracilis (Nutt.) Shinners	Slender tansyaster	AZ	4.79	15.22	20.01	4132
	Machaeranthera gracilis (Nutt.) Shinners	Slender tansyaster	AZ	1.76	3.75	5.51	5630
	Machaeranthera pinnatifida (Hook.) Shinners	Tansyaster	AZ	0.95	10.11	11.06	5146
	Machaeranthera pinnatifida ssp. gooddingii (Nels.) B.L. Turner & Hartman	Tansyaster	AZ	1.50	14.38	15.88	5141
	Machaeranthera rubricaulis Rydb.	Tansyaster	CO	3.06	17.57	20.63	4607

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Asteraceae	Machaeranthera tanacetifolia (H.B.K.) Nees	Tansyaster	AZ	2.12	16.54	18.66	4109
	Madia elegans D. Don ex Lindl.	Common tarweed	OR	8.91	14.90	23.81	4419
	Madia elegans D. Don ex Lindl.	Common tarweed	OR	4.01	17.32	21.33	5227
	Madia glomerata Hook.	Cluster tarweed	ID	8.03	9.45	17.48	4446
	Madia glomerata Hook.	Cluster tarweed	ID	5.01	7.86	12.87	5327(R)
	Madia glomerata Hook.	Cluster tarweed	NM	5.34	11.30	16.64	4406
	Madia gracilis (Smith) Keck	Slender tarweed	CA	3.08	15.30	18.38	5229
	Malacothrix californica var. glabrata Eaton	Desert dandelion	NV	5.48	21.53	27.01	3928
	Matricaria perforata Merat	False camomile; Mayweed	CO	3.29	18.96	22.25	4592
	Melampodium leucanthum Torr. & Gray	Black-foot	AZ	2.31	14.28	16.59	5631
	Parthenium argentatum Gray	Guayule	TX	14.49	12.98	27.47	3558
	Parthenium argentatum Gray	Guayule	TX	15.36	15.42	30.78	4735(R)
	Parthenium confertum Gray		TX	4.43	30.25	34.68	5195
	Parthenium incanum H.B.K.	Mariola	TX	5.67	13.79	19.46	3583
	Pectis papposa Harvey & Gray	Chinchweed	AZ	3.88	17.88	21.76	5768
	Pericome caudata Gray	Tailleaf pericome	NM	3.97	16.57	20.54	4334
	Perityle vaseyi Coult.	Rock daisy	TX	4.92	22.91	27.83	5180
	Petradoria pumila (Nutt.) Greene	Rock goldenrod	UT	3.24	14.08	17.32	4608
	Porophyllum scoparium Gray	Broom poreleaf	TX	3.17	16.22	19.39	3561
	Prionopsis ciliata Nutt.		TX	5.13	15.72	20.85	4732
	Psilostrophe bakeri Greene	Baker's paperflower	CO	1.99	14.73	16.72	4503
	Psilostrophe cooperi (Gray) Greene	Whitestem paperflower	AZ	1.77	11.46	13.23	4135
	Psilostrophe cooperi (Gray) Greene	Whitestem paperflower	NV	2.50	17.72	20.22	3866
	Psilostrophe villosa Rydb.	Hairy paperflower	TX	1.42	14.44	15.86	4076
	Ratibida columnifera (Nutt.) Woot. & Standl.	Upright prairie coneflower	CO	5.10	9.70	14.80	4290
	Ratibida columnifera (Nutt.) Woot. & Standl.	Upright prairie coneflower	TX	3.15	15.07	18.22	4045
	Rudbeckia laciniata var. ampla (Nels.) Cronq.	Cutleaf coneflower	CO	2.73	16.24	18.97	4266
	Senecio atratus Greene	Black groundsel	CO	2.81	17.50	20.31	4756
	Senecio bigelovii Gray	Bigelow's groundsel	CO	2.48	16.17	18.65	4757
	Senecio bigelovii Gray	Bigelow's groundsel	CO	1.17	13.47	14.64	5649
	Senecio canus Hook.	Wooly groundsel	UT	1.85	18.15	20.00	5572
	Senecio crocatus Rydb.	Saffron groundsel	CO	1.67	27.73	29.40	5272
	Senecio dimorphophyllus Greene	Groundsel	WY	2.05	24.72	26.77	5264
	Senecio douglasii DC.	Douglas' groundsel	AZ	2.21	16.58	18.79	4107
	Senecio douglasii var. longilobus (Benth.) L. Benson	Threadleaf groundsel	AZ	1.90	16.83	18.73	4096
	Senecio douglasii var. monoensis (Greene) Jepson	Douglas' groundsel	UT	1.85	10.91	12.76	3910
	Senecio eremophilus Richards.	Desert groundsel	UT	2.97	10.74	13.71	4597

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Asteraceae	Senecio eremophilus var. kingii (Rydb.) Greenm.	Desert groundsel	CO	2.03	19.24	21.27	5641
	Senecio eremophilus var. kingii (Rydb.) Greenm.	Desert groundsel	WY	1.89	17.11	19.00	5251
	Senecio fendleri Gray	Fendler's groundsel	CO	2.18	32.51	34.69	5257
	Senecio hydrophilus Nutt.	Water groundsel	CO	2.79	19.70	22.49	5255
	Senecio hydrophilus Nutt.	Water groundsel	CO	1.77	17.93	19.70	5648
	Senecio hydrophilus Nutt.	Water groundsel	ID	4.00	19.22	23.22	5120
	Senecio integerrimus var. exaltatus (Nutt.) Cronq.	Lambstongue groundsel	WA	2.59	24.23	26.82	3965
	Senecio jacobaea L.	Jacob's groundsel	CA	1.58	20.80	22.38	5231
	Senecio multicapitatus Greenm.	Groundsel	CO	3.42	13.60	17.02	4539
	Senecio multilobatus Torr. & Gray ex Gray	Lobeleaf groundsel	NV	2.08	37.65	39.73	3927
	Senecio multilobatus Torr. & Gray ex Gray	Lobeleaf groundsel	NV	2.50	35.12	37.62	4707(R)
	Senecio neomexicanus Gray	New Mexico groundsel	NM	1.63	28.91	30.54	5244
	Senecio neomexicanus var. mutabilis (Greene) Barkl.	New Mexico groundsel	UT	2.87	22.40	25.27	5293
	Senecio pauperculus Michx.	Balsam groundsel	CO	1.97	29.12	31.09	5269
	Senecio pseudaureus var. flavulus (Greene) Greenm.	Golden groundsel	CO	1.75	25.51	27.26	5249
	Senecio rapifolius Nutt.	Groundsel	CO	3.36	19.64	23.00	4755
	Senecio serra Hook.	Butterweed groundsel	ID	2.69	17.01	19.70	5118
	Senecio spartioides Torr. & Gray	Broom groundsel	CO	2.72	17.55	20.27	4323
	Senecio triangularis Hook.	Arrowleaf groundsel	CO	1.55	26.34	27.89	4748
	Senecio triangularis Hook.	Arrowleaf groundsel	CO	0.82	13.68	14.50	5652
	Senecio vulgaris L.	Common groundsel	CO	2.44	30.24	32.68	5258
	Senecio wootonii Greene	Wooton's groundsel	WY	2.44	23.88	26.32	5263
	Solidago canadensis L.	Canada goldenrod	CO	4.09	17.71	21.80	4287
	Solidago canadensis var. gilvocanescens Rydb.	Canada goldenrod	CO	3.15	20.80	23.95	5607
	Solidago canadensis var. gilvocanescens Rydb.	Canada goldenrod	ID	3.55	18.15	21.70	5317
	Solidago canadensis var. salebrosa (Piper) Jones	Canada goldenrod	ID	4.44	23.51	27.95	4434
	Solidago canadensis var. salebrosa (Piper) Jones	Canada goldenrod	ID	7.62	19.35	26.97	4385
	Solidago canadensis var. salebrosa (Piper) Jones	Canada goldenrod	ID	4.82	19.65	24.47	5123(R)
	Solidago gigantea var. serotina (Ait.) Cronq.	Giant goldenrod	WA	8.76	21.04	29.80	4447
	Solidago gigantea var. serotina (Ait.) Cronq.	Giant goldenrod	WA	5.23	23.32	28.55	5234(R)
	Solidago missouriensis Nutt.	Missouri goldenrod	NV	6.00	20.20	26.20	5117
	Solidago mollis Bartl.	Velvety goldenrod	ND	3.78	16.57	20.35	4570
	Solidago multiradiata var. scopulorum Gray	Mountain goldenrod	CO	5.76	24.63	30.39	5267
	Solidago multiradiata var. scopulorum Gray	Mountain goldenrod	CO	2.73	18.66	21.39	5650
	Solidago nana Nutt.	Baby goldenrod	CO	2.87	23.21	26.08	4548
	Solidago rigida L.	Stiff goldenrod	ND	5.64	11.93	17.57	4571
	Solidago rupestris Raf.	Goldenrod	CO	2.33	20.04	22.37	5642

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Asteraceae	Solidago sparsiflora Gray	Slender goldenrod	CO	5.61	18.23	23.84	4595
	Solidago sparsiflora Gray	Slender goldenrod	ID	4.60	24.48	29.08	5116
	Solidago spathulata DC.	Coast goldenrod	CO	2.76	20.65	23.41	5252
	Solidago speciosa var. pallida Porter	Showy goldenrod	CO	1.99	19.67	21.66	5270
	Solidago wrightii Gray	Wright's goldenrod	AZ	6.76	14.38	21.14	5634
	Sonchus asper (L.) Hill	Prickly sowthistle	UT	3.69	16.49	20.18	3477
	Sonchus oleraceus L.	Common sowthistle	MT	3.74	23.10	26.84	4381
	Sonchus oleraceus L.	Common sowthistle	ID	3.77	28.93	32.70	5315
	Stephanomeria paniculata Nutt.	Wire lettuce	OR	5.90	15.21	21.11	5310
	Stephanomeria pauciflora (Torr.) Nutt.	Wire lettuce	NV	5.09	21.49	26.58	3913
	Stephanomeria pauciflora (Torr.) Nutt.	Wire lettuce	AZ	7.16	15.59	22.75	4122
	Stephanomeria tenuifolia (Torr.) Hall	Slender wire lettuce	CO	4.88	15.54	20.42	4546
	Tanacetum vulgare L.	Common tansy	ID	2.31	14.76	17.07	4377
	Tanacetum vulgare L.	Common tansy	WA	4.14	23.86	28.00	4437
	Tessaria sericea (Nutt.) Shinners	Arrow-weed	UT	5.85	15.62	21.47	4718
	Tetradymia canescens DC.	Spineless horsebrush	UT	2.18	11.23	13.41	4590
	Tetradymia glabrata Torr. & Gray	Littleleaf horsebrush	NV	3.50	13.04	16.54	3907
	Tetradymia glabrata Torr. & Gray	Littleleaf horsebrush	CA	3.11	12.85	15.96	4693
	Tetradymia spinosa Hook. & Arn.	Cottonthorn horsebrush	CO	2.08	17.73	19.81	3996
	Thelesperma megapotamicum (Spreng.) Kuntze	Navajo tea	AZ	1.11	16.45	17.56	5133
	Tragopogon dubius Scop.	Goatsbeard	WA	4.10	22.38	26.48	3945
	Tragopogon dubius Scop.	Goatsbeard	AZ	5.09	19.29	24.38	4028
	Tragopogon dubius Scop.	Goatsbeard	TX	5.96	22.00	27.96	4044
	Tragopogon dubius Scop.	Goatsbeard	ID	5.46	15.85	21.31	4422
	Tragopogon dubius Scop.	Goatsbeard	ND	3.92	21.85	25.77	4578
	Trixis californica Kellogg	American trixis	AZ	2.79	15.73	18.52	5142
	Trixis californica Kellogg	American trixis	TX	7.30	18.98	26.28	5215
	Verbesina encelioides (Cav.) Benth. & Hook. f. ex Gray	Golden crownbeard	CO	2.69	12.16	14.85	4336
	Verbesina encelioides (Cav.) Benth. & Hook. f. ex Gray	Golden crownbeard	UT	2.87	15.84	18.71	4599
	Verbesina encelioides (Cav.) Benth. & Hook. f. ex Gray	Golden crownbeard	AZ	3.03	19.81	22.84	4166
	Vernonia marginata (Torr.) Raf.	Plains ironweed	TX	6.41	21.79	28.20	4074
	Viguiera annua (Jones) Blake	Annual goldeneye	AZ	1.43	20.86	22.29	5637
	Viguiera deltoidea Gray	Shrubby goldeneye	AZ	2.36	10.98	13.34	4118
	Viguiera longifolia (Robins. & Greenm.) Blake	Longleaf goldeneye	TX	2.28	19.18	21.46	3570
	Viguiera multiflora (Nutt.) Blake	Showy goldeneye	UT	1.84	21.40	23.24	3872
	Viguiera multiflora (Nutt.) Blake	Showy goldeneye	CO	1.62	20.53	22.15	4551
	Viguiera multiflora (Nutt.) Blake	Showy goldeneye	CO	1.70	17.34	19.04	4267

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Asteraceae	Viguiera stenoloba Blake	Resin bush	TX	4.87	19.40	24.27	3577
	Wyethia scabra var. canescens W.A. Weber	Badlands wyethia	UT	3.22	20.61	23.83	4505
	Xanthium strumarium L.	Cockle-bur	CO	3.77	13.14	16.91	4339
	Zinnia acerosa (DC.) Gray	Zinnia	AZ	1.76	8.02	9.78	5150
Berberidaceae	Mahonia fremontii (Torr.) Fedde	Fremont barberry	UT	2.44	24.99	27.43	3987
	Mahonia haematocarpa (Woot.) Fedde	Red barberry	AZ	1.53	19.62	21.15	5620
Bignoniaceae	Chilopsis linearis (Cav.) Sweet	Desert willow	AZ	3.68	30.67	34.35	4095
	Chilopsis linearis (Cav.) Sweet	Desert willow	AZ	3.21	28.55	31.76	5137(R)
	Chilopsis linearis (Cav.) Sweet	Desert willow	TX	4.62	30.16	34.78	4130
	Tecoma stans (L.) Juss. ex H.B.K.	Trumpet bush	TX	2.70	26.15	28.85	4128
Boraginaceae	Amsinckia lycopsoides (Lehm.) Lehm.	Tarweed fiddleneck	WA	3.99	9.16	13.15	3968
	Amsinckia tessellata Gray	Western fiddleneck	NV	4.17	15.29	19.46	3898
	Cryptantha elata (Eastw.) Payson		CO	1.81	14.06	15.87	3999
	Cryptantha flava (A. Nels.) Payson	Yellow cryptantha	UT	0.83	9.43	10.26	3986
	Cryptantha virgata (Porter) Payson	Miner's candle	CO	1.81	13.98	15.79	4231
	Lithospermum ruderale Dougl. ex Lehm.	Yellow stoneseed	WA	2.79	16.06	18.85	3963
	Tiquilia greggii (Torr. & Gray) Richardson	Plume tiquilia	TX	2.17	10.93	13.10	3557
Brassicaceae	Berteroa incana (L.) DC.	Hoary false-alyssum	MT	1.79	11.59	13.38	4368
	Berteroa incana (L.) DC.	Hoary false-alyssum	CO	1.64	15.71	17.35	4407
	Cardaria draba (L.) Desv.	Heart-podded whitetop	NV	1.96	17.92	19.88	3882
	Cardaria draba (L.) Desv.	Heart-podded whitetop	WA	1.97	27.93	29.90	3961
	Chorispora tenella (Pall.) DC.	Blue mustard	WA	2.17	25.52	27.69	3958
	Descurainia pinnata (Walt.) Britt.	Blue tansy mustard	WA	1.92	17.62	19.54	3953
	Dimorphocarpa wislizenii (Engelm.) Rollins	Spectacle pod	TX	2.20	14.22	16.42	4075
	Erysimum asperum (Nutt.) DC.	Western wallflower	WA	1.48	18.94	20.42	3948
	Isatis tinctoria L.	Dyer's woad	UT	1.45	7.04	8.49	3354
	Lepidium fremontii S. Wats.	Desert pepperweed	NV	2.21	22.11	24.32	3889
	Lepidium montanum Nutt.	Mountain pepperweed	CO	1.76	19.82	21.58	4286
	Lepidium montanum var. angustifolium Hitchc.	Mountain pepperweed	TX	2.59	16.71	19.30	5178
	Sisymbrium altissimum L.	Tumble mustard	UT	1.68	13.54	15.22	3903
	Sisymbrium altissimum L.	Tumble mustard	CO	1.61	14.54	16.15	4348
	Sisymbrium altissimum L.	Tumble mustard	WA	1.21	14.85	16.06	4457
	Stanleya pinnata (Pursh) Britt.	Prince's plume	WY	1.34	12.60	13.94	4575
	Stanleya pinnata (Pursh) Britt.	Prince's plume	UT	2.01	13.12	15.13	3918
	Stanleya pinnata (Pursh) Britt.	Prince's plume	CO	1.94	25.41	27.35	3984

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Brassicaceae	Stanleya pinnata var. integrifolia (James) Rollins	Prince's plume	CO	5.97	17.50	23.47	4295
	Streptanthella longirostris (S. Wats.) Rydb.	Little twistflower	UT	4.00	25.79	29.79	3877
	Thelypodium laciniatum (Hook.) Endl.	Cutleaf mustard; thelypody	WA	2.26	20.93	23.19	3967
Buxaceae	Simmondsia chinensis (Link) Schneid.	Jojoba	AZ	2.99	18.98	21.97	4110
Capparidaceae	Cleome isomeris Greene	Bladderpod	AZ	1.76	22.11	23.87	5174
	Cleome lutea Hook.	Yellow beeplant	CA	3.15	21.98	25.13	3925
	Cleome lutea Hook.	Yellow beeplant	CO	1.73	23.36	25.09	3985
	Cleome serrulata Pursh	Rocky mountain beeplant	CO	2.21	12.80	15.01	4532
	Cleome serrulata Pursh	Rocky mountain beeplant	NM	1.62	15.42	17.04	4346
	Cleomella longipes Torr.	Stinkweed	TX	4.95	20.79	25.74	5184
	Polanisia dodecandra ssp. trachysperma (T. & G.) Iltis	Western clammyweed	AZ	5.22	17.18	22.40	4134
	Polanisia dodecandra ssp. trachysperma (T. & G.) Iltis	Western clammyweed	CO	4.56	11.56	16.12	4400
	Polanisia uniglandulosa (Cav.) DC.	Mexican clammyweed	TX	2.44	19.35	21.79	5214
	Wislizenia refracta Engelm.	Jackass clover	AZ	1.68	23.63	25.31	5136
Caprifoliaceae	Sambucus caerulea var. neomexicana (Woot.) Rehd.	Blue elderberry	AZ	6.26	22.14	28.40	4131
	Symphoricarpos oreophilus Gray	Mountain snowberry	UT	1.44	15.04	16.48	4720
Caryophyllaceae	Saponaria officinalis L.	Bouncing bet; Soapwort	CO	2.42	34.28	36.70	4331
	Saponaria officinalis L.	Bouncing bet; Soapwort	CO	2.36	32.12	34.48	5246(R)
	Silene alba (Mill.) Krause	Evening campion	CO	2.99	17.42	20.41	4393
	Silene noctiflora L.	Night-flowering campion	ID	1.82	15.18	17.00	4369
Celastraceae	Mortonia sempervirens Gray	Mortonia	TX	10.67	19.30	29.97	5210
	Mortonia sempervirens Gray	Mortonia	TX	10.42	18.59	29.01	5210-2ND
Chenopodiaceae	Allenrolfea occidentalis (S. Wats.) Kuntze	Iodine bush	TX	1.98	25.99	27.97	4068
	Allenrolfea occidentalis (S. Wats.) Kuntze	Iodine bush	UT	3.01	31.59	34.60	4363
	Allenrolfea occidentalis (S. Wats.) Kuntze	Iodine bush	UT	1.77	26.24	28.01	5125(R)
	Atriplex acanthocarpa (Torr.) S. Wats.	Saltbush	TX	1.48	18.16	19.64	4092
	Atriplex canescens (Pursh) Nutt.	Fourwing saltbush	CO	1.40	18.98	20.38	4343
	Atriplex canescens (Pursh) Nutt.	Fourwing saltbush	TX	2.00	22.67	24.67	3554
	Atriplex confertifolia (Torr. & Frem.) S. Wats.	Shadscale	UT	1.41	13.21	14.62	3142
	Atriplex confertifolia (Torr. & Frem.) S. Wats.	Shadscale	CO	1.34	18.96	20.30	4500
	Atriplex elegans (Moq.) Dietr.	Wheelscale saltbush	AZ	1.64	21.49	23.13	5144
	Atriplex heterosperma Bunge	Saltbush	NV	1.31	14.65	15.96	4370
	Atriplex linearis S. Wats.	Saltbush	AZ	1.32	10.46	11.78	5617
	Atriplex polycarpa (Torr.) S. Wats.	Cattle saltbush	AZ	1.65	15.56	17.21	5618

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Chenopodiaceae	Bassia hyssopifolia (Pallas) Kuntze	Smother weed	TX	1.68	10.19	11.87	3572
	Ceratoides lanata (Pursh) J.T. Howell	Winterfat	UT	2.61	11.08	13.69	3874
	Chenopodium album L.	Lambsquarters goosefoot	WA	1.15	19.42	20.57	4452
	Chenopodium album L.	Lambsquarters goosefoot	CO	1.55	22.37	23.92	4354
	Grayia spinosa (Hook.) Moq.	Spiny hopsage	NV	0.94	9.40	10.34	3869
	Grayia spinosa (Hook.) Moq.	Spiny hopsage	CA	2.48	9.95	12.43	3878
	Salsola kali L.	Russian thistle	TX	1.44	17.08	18.52	3574
	Salsola kali L.	Russian thistle	ID	2.18	12.46	14.64	4435
	Sarcobatus vermiculatus (Hook.) Torr.	Greasewood	CO	1.76	18.22	19.98	4225
	Sarcobatus vermiculatus (Hook.) Torr.	Greasewood	CO	1.93	16.10	18.03	4545
	Suaeda suffrutescens S. Wats.	Desert seepweed	TX	1.73	24.41	26.14	4079
	Suaeda torreyana S. Wats.	Bush seepweed	NV	2.17	22.35	24.52	3892
	Suaeda torreyana S. Wats.	Bush seepweed	NV	2.35	23.10	25.45	4365
	Suaeda torreyana S. Wats.	Bush seepweed	AZ	2.05	24.16	26.21	5635
Cistaceae	Cistus villosus L.	Rock Rose	CA	1.99	18.12	20.11	4105
Clusiaceae	Hypericum perforatum L.	St. John's wort	CO	5.44	21.59	27.03	4227
	Hypericum perforatum L.	St. John's wort	WA	4.51	29.38	33.89	4454
	Hypericum perforatum L.	St. John's wort	WA	3.02	21.22	24.24	4692(R)
	Hypericum perforatum L.	St. John's wort	OR	5.47	21.82	27.29	4417
	Hypericum perforatum L.	St. John's wort	WA	10.44	18.07	28.51	4413
Convolvulaceae	Convolvulus arvensis L.	Creeping Jenny	WA	1.95	30.76	32.71	5325
	Ipomoea leptophylla Torr.	Bush morning glory	CO	4.36	13.97	18.33	4292
Cucurbitaceae	Apodanthera undulata Gray	Melon-loco	TX	2.78	20.62	23.40	5187
	Cucurbita foetidissima H.B.K.	Wild buffalo gourd	AZ	2.46	21.69	24.15	4015
	Cucurbita foetidissima H.B.K.	Wild buffalo gourd	CO	1.42	16.23	17.65	4299
Dipsacaceae	Dipsacus fullonum L.	Wild teasel	CO	1.52	18.11	19.63	4395
Ebenaceae	Diospyros texana Scheele	Texas persimmon	TX	4.28	23.55	27.83	4090
Elaeagnaceae	Elaeagnus angustifolia L.	Russian olive	AZ	3.03	16.69	19.72	4108
	Elaeagnus commutata Bernh. ex Rydb.	Silverberry	WA	1.88	18.46	20.34	3949
	Shepherdia rotundifolia Parry	Roundleaf buffaloberry	UT	5.24	27.21	32.45	4508
Ephedraceae	Ephedra nevadensis S. Wats.	Mormon tea	UT	1.90	16.90	18.80	3914
	Ephedra nevadensis var. aspera (Engelm.) Benson		TX	1.43	22.63	24.06	3564
Ericaceae	Arbutus arizonica (Gray) Sarg.	Arizona madrone; Madroño	AZ	3.26	30.66	33.92	4021
	Arbutus arizonica (Gray) Sarg.	Arizona madrone; Madroño	AZ	2.82	31.36	34.18	5614(R)
	Arbutus texana Buckl.	Texas madrone	TX	6.36	32.62	38.98	5194
	Arctostaphylos patula Greene	Greenleaf manzanita	CO	4.90	32.81	37.71	3990
	Arctostaphylos patula Greene	Greenleaf manzanita	CO	4.35	35.29	39.64	5604(R)
	Arctostaphylos pringlei Parry	Manzanita	AZ	7.23	29.33	36.56	3837

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Ericaceae	Arctostaphylos pungens H.B.K.	Pointleaf manzanita	AZ	4.04	33.61	37.65	4136
	Arctostaphylos pungens H.B.K.	Pointleaf manzanita	AZ	3.01	27.95	30.96	5615(R)
Euphorbiaceae	Argythamnia lanceolata (Benth.) Muell.-Arg.		AZ	1.61	11.18	12.79	5153
	Chamaesyce fendleri (Torr. & Gray) Small	Fendler's euphorbia	UT	2.72	26.68	29.40	4699
	Chamaesyce fendleri (Torr. & Gray) Small	Fendler's euphorbia	UT	1.41	22.81	24.22	5570
	Chamaesyce fendleri (Torr. & Gray) Small	Fendler's euphorbia	CO	3.17	30.34	33.51	5281
	Chamaesyce glyptosperma (Engelm.) Small	Ridgeseed spurge	WA	2.67	17.15	19.82	5324
	Chamaesyce maculata (L.) Small	Spotted spurge	WA	4.23	21.56	25.79	5319
	Chamaesyce parryi (Engelm.) Rydb.	Parry's euphorbia	UT	3.54	18.34	21.88	4601
	Cnidoscolus texanus (Muell.-Arg.) Small	Bull nettle	TX	9.71	18.81	28.52	4078
	Cnidoscolus texanus (Muell.-Arg.) Small	Bull nettle	TX	5.92	22.38	28.30	4736(R)
	Croton fruticulosus Torr.	Croton	TX	3.09	11.35	14.44	3579
	Croton texensis (Klotzsch) Muell.-Arg.	Texas croton	CO	2.85	13.57	16.42	4278
	Euphorbia antisyphilitica Zucc.	Candelilla	TX	12.44	12.90	25.34	3353
	Euphorbia antisyphilitica Zucc.	Candelilla	TX	10.96	12.44	23.40	4739(R)
	Euphorbia cyparissias L.	Cypress euphorbia	WA	7.71	22.75	30.46	5330
	Euphorbia eriantha Benth.	Spurge	AZ	4.43	15.69	20.12	5152
	Euphorbia esula L.	Leafy spurge	CO	5.48	20.72	26.20	4335
	Euphorbia esula L.	Leafy spurge	ND	3.30	16.96	20.26	4577
	Euphorbia lathyris L.	Gopherweed	UT	5.17	21.24	26.41	5126
	Euphorbia marginata Pursh	Snow-on-the-mountain	CO	4.74	15.61	20.35	4298
	Euphorbia robusta (Engelm.) Small	Robust euphorbia	AZ	4.54	19.66	24.20	3835
	Jatropha dioica Sesse ex Cerv.	Leather stem	TX	4.73	12.70	17.43	3555
	Poinsettia dentata (Michx.) Klotzsch & Garcke	Toothed spurge	CO	6.22	12.37	18.59	4753
	Poinsettia dentata (Michx.) Klotzsch & Garcke	Toothed spurge	KS	3.01	17.01	20.02	5283
	Stillingia sylvatica Garden ex L.	Queen's delight	TX	7.87	8.43	16.30	4066
	Stillingia sylvatica Garden ex L.	Queen's delight	TX	4.57	40.89	45.46	4733(R)
	Stillingia sylvatica Garden ex L.	Queen's delight	TX	4.72	43.30	48.02	4733(R)2ND
Fabaceae	Acacia neovernicosa Isley	Acacia	TX	3.09	15.67	18.76	4091
	Acacia schottii Torr.	Acacia	TX	2.54	13.61	16.15	4072
	Amorpha fruticosa L.	Indigo Bush	AZ	2.91	17.13	20.04	4019
	Amorpha fruticosa L.	Indigo Bush	CO	2.40	22.14	24.54	4234
	Astragalus asclepiadoides M.E. Jones	Milkweed milkvetch	CO	1.73	20.57	22.30	3988
	Astragalus bisulcatus (Hook.) Gray	Two-grooved locoweed	MT	1.35	14.47	15.82	4576

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Fabaceae	Astragalus filipes Torr. ex Gray	Milkvetch	NV	1.88	23.28	25.16	3888
	Astragalus lonchocarpus Torr.	Rushy milkvetch	CO	1.34	23.97	25.31	4003
	Astragalus pattersonii Gray ex Brand	Patterson's locoweed	CO	1.25	19.42	20.67	4542
	Caesalpinia gilliesii (Wallich) A. Dietr.	Bird of paradise	TX	3.09	21.06	24.15	4038
	Cassia armata S. Wats.	Desert senna	AZ	1.80	13.99	15.79	4032
	Cassia covesii Gray	Hairy senna	AZ	2.12	17.86	19.98	4100
	Coronilla varia L.	Crownvetch	WA	1.66	29.82	31.48	4456
	Coronilla varia L.	Crownvetch	WA	1.51	23.34	24.85	4690(R)
	Dalea frutescens Gray	Black dalea	TX	3.02	20.43	23.45	4125
	Dalea oligophylla (Torr.) Shinners	Prairie clover	UT	3.08	14.44	17.52	4613
	Dalea searlsiae (Gray) Barneby	Searls prairieclover	UT	1.89	18.02	19.91	4714
	Dalea villosa (Nutt.) Spreng.	Silky prairieclover	CO	1.52	21.94	23.46	4271
	Glycyrrhiza lepidota (Nutt.) Pursh	American licorice	CA	4.06	19.89	23.95	3883
	Glycyrrhiza lepidota (Nutt.) Pursh	American licorice	NE	5.01	18.20	23.21	4276
	Glycyrrhiza lepidota (Nutt.) Pursh	American licorice	CO	2.60	13.86	16.46	4533
	Hedysarum boreale Nutt.	Northern sweetvetch	CO	1.32	21.39	22.71	4496
	Leucaena leucocephala (Lam.) de Wit	Popinaca; Leucaena	TX	3.44	15.39	18.83	3132
	Leucaena retusa Benth.	Lead tree	TX	4.09	16.11	20.20	3582
	Lupinus barbigeri S. Wats.	Barbiger lupine	CO	1.73	18.85	20.58	4356
	Lupinus bingenensis var. subsaccatus Suks.	Lupine	WA	1.72	22.84	24.56	3959
	Lupinus caudatus Kellogg	Tailcup lupine	UT	1.82	18.35	20.17	3875
	Lupinus greenei A. Nels.	Greene's lupine	CO	2.00	23.04	25.04	4497
	Lupinus sericeus Pursh	Silky lupine	WA	2.24	22.35	24.59	3942
	Melilotus officinalis (L.) Pallas	Yellow sweetclover	WA	1.57	27.98	29.55	4455
	Prosopis glandulosa Torr.	Honey mesquite	TX	2.69	22.84	25.53	4069
	Psoralea lanceolata Pursh	Lemon scurf-pea	CO	4.86	18.82	23.68	5575
	Psoralea megalantha Woot. & Standl.	Scurf-pea	CO	0.41	9.21	9.62	5577
	Psoralea tenuiflora Pursh	Slimflower scurf-pea	CO	8.86	15.52	24.38	4345
	Psoralea tenuiflora Pursh	Slimflower scurf-pea	CO	6.63	17.61	24.24	4746(R)
	Psorothamnus arborescens var. pubescens (Par.) Barn.	Indigo bush	AZ	3.00	13.17	16.17	4123
	Psorothamnus emoryi (Gray) Rydb.	Emory's dalea	AZ	2.19	14.01	16.20	4138
	Psorothamnus fremontii (Torr. ex Gray) Barneby	Fremont's prairieclover	NV	2.30	10.58	12.88	3906
	Psorothamnus polydenius (Torr.) Rydb.	Indigo bush	CA	1.66	11.98	13.64	3893
	Rhynchosia senna var. angustifolia (Gray) Grear	Rosary bean	TX	2.47	17.51	19.98	5189
	Robinia neomexicana Gray	New Mexico Locust	AZ	3.29	17.05	20.34	4020
	Robinia neomexicana Gray	New Mexico Locust	CO	3.26	18.01	21.27	4229
	Thermopsis montana Nutt.	Mountain false-lupin	UT	2.16	28.56	30.72	4709

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Fabaceae	Vicia villosa Roth	Hairy Vetch	WA	2.96	19.99	22.95	3943
Fagaceae	Quercus gambelii Nutt.	Gambel's oak	CO	1.42	21.40	22.82	3989
	Quercus havardii Rydb.	Shinnery oak	TX	2.26	18.67	20.93	4081
	Quercus havardii Rydb. X Quercus gambelii Nutt.	Hybrid scrub oak	UT	1.48	18.93	20.41	4596
	Quercus hypoleucoides A. Camus	Whiteleaf oak	TX	3.61	17.73	21.34	3553
Fouquieriaceae	Fouquieria splendens Engelm.	Ocotillo	TX	7.41	14.78	22.19	3563
Garryaceae	Garrya flavescens S. Wats.	Silk-tassel bush	NV	5.27	22.58	27.85	4700
	Garrya flavescens S. Wats.	Silk-tassel bush	AZ	4.25	23.43	27.68	5623
Geraniaceae	Erodium cicutarium (L.) L'Her.	Storksbill	WA	2.42	18.16	20.58	3944
	Geranium caespitosum var. eremophilum (W. & S.) Mar.	Purple geranium	CO	1.21	22.23	23.44	5647
	Geranium fremontii Torr. ex Gray	Fremont's geranium	ID	1.85	33.98	35.83	5121
	Geranium fremontii Torr. ex Gray	Fremont's geranium	CO	1.90	25.44	27.34	5266
	Geranium parryi (Engelm.) Heller	Parry's geranium	CO	2.63	31.63	34.26	5256
	Geranium richardsonii Fisch. & Trautv.	Richardson's geranium	CO	1.62	23.12	24.74	5605
	Geranium richardsonii Fisch. & Trautv.	Richardson's geranium	CO	1.55	20.10	21.65	4758
	Geranium viscosissimum Fisch. & Meyer	Sticky geranium	WA	3.01	37.28	40.29	3964
	Geranium viscosissimum Fisch. & Meyer	Sticky geranium	WA	4.10	30.03	34.13	4689(R)
	Geranium viscosissimum var. nervosum (Rydb.) Hitchc.	Sticky geranium	CO	1.47	23.56	25.03	5280
Hydrophyllaceae	Eriodictyon angustifolium Nutt.	Narrowleaf yerba santa	UT	4.88	25.08	29.96	3823
	Eriodictyon angustifolium Nutt.	Narrowleaf yerba santa	UT	4.35	20.24	24.59	3916
	Eriodictyon angustifolium Nutt.	Narrowleaf yerba santa	AZ	4.65	30.66	35.31	4034
	Eriodictyon angustifolium Nutt.	Narrowleaf yerba santa	AZ	3.70	23.47	27.17	5154(R)
	Eriodictyon lanatum (Brand) Abrams	Yerba santa	CA	4.93	25.52	30.45	4024
	Hydrophyllum fendleri (Gray) Heller	Fendler's waterleaf	WA	2.46	26.14	28.60	3957
	Nama carnosum (Woot.) C.L. Hitchc.	Nama	TX	1.51	11.07	12.58	4071
	Phacelia heterophylla Pursh	Varileaf scorpionweed	CO	1.78	19.43	21.21	4269
	Phacelia neomexicana Thurb. ex Torr.	New Mexico scorpionweed	CO	3.34	10.64	13.98	4328
Juglandaceae	Juglans microcarpa Berl.	River Walnut	TX	5.16	22.41	27.57	5177
Krameriaceae	Krameria parvifolia var. imparata Macbr.	Littleleaf krameria	NV	1.29	15.59	16.88	3902
Lamiaceae	Agastache pallidiflora ssp. neomexicana (Briq.) L. & E.	Pale giant hyssop	NM	2.97	18.61	21.58	4402
	Agastache urticifolia (Benth.) Kuntze	Giant hyssop	ID	2.36	12.05	14.41	4382
	Hedeoma molle Torr.	Mock pennyroyal	TX	4.57	13.08	17.65	5211
	Hyptis emoryi Torr.	Desert lavender	AZ	4.43	12.22	16.65	4102

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Lamiaceae	Marrubium vulgare L.	Common horehound	NV	2.59	18.74	21.33	3899
	Marrubium vulgare L.	Common horehound	CO	2.41	20.82	23.23	3982
	Marrubium vulgare L.	Common horehound	CO	3.73	14.74	18.47	4228
	Monarda fistulosa var. menthifolia (Graham) Fern.	Longflowered horsemint	AZ	2.49	20.23	22.72	4012
	Monarda punctata var. coryi (McClint. & Epling) Cory	Spotted beebalm	TX	5.06	9.34	14.40	4073
	Poliomintha incana (Torr.) Gray	Rosemary mint	UT	3.42	23.73	27.15	4490
	Salazaria mexicana Torr.	Mexican bladdersage	NV	2.68	11.09	13.77	3887
	Salvia apiana Jepson	White sage	CA	3.75	25.53	29.28	4025
	Salvia dorrii (Kellogg) Abrams	Purple sage	WA	6.58	22.92	29.50	3956
	Salvia leptophylla Benth.	Sage	TX	1.86	16.10	17.96	5200
Liliaceae	Asparagus officinalis L.	Garden asparagus	NV	1.86	21.08	22.94	3885
Loasaceae	Cevallia sinuata Lag.		TX	3.10	10.14	13.24	4737
	Mentzelia albicaulis (Dougl.) Torr. & Gray	Whitestem blazing star	NV	1.71	15.62	17.33	3881
	Mentzelia decapetala (Pursh) Urban & Gilg	Tenpetal blazing star	WY	1.32	29.66	30.98	4337
	Mentzelia decapetala (Pursh) Urban & Gilg	Tenpetal balzing star	WY	8.60	17.01	25.61	4747(R)
	Mentzelia humilis (Gray) Darl.	Blazing star	NM	1.16	19.55	20.71	5291
	Mentzelia laciniata (Rydb.) Darl.	Blazing star	NM	1.55	23.19	24.74	5285
	Mentzelia laevicaulis (Dougl.) Torr. & Gray	Blazing star	NV	1.31	29.43	30.74	4701
	Mentzelia multiflora (Nutt.) Gray	Desert blazing star	CO	1.28	22.88	24.16	5288
	Mentzelia multiflora (Nutt.) Gray	Desert blazing star	CO	5.12	17.48	22.60	5609
	Mentzelia multiflora (Nutt.) Gray	Desert blazing star	CO	1.58	24.72	26.30	5284
	Mentzelia nitens Greene	Blazing star	AZ	1.61	17.44	19.05	5292
	Mentzelia nuda var. stricta (Osterh.) Harrington	Blazing star	CO	1.51	16.29	17.80	4405
	Mentzelia pumila (Nutt.) Torr. & Gray	Golden blazing star	AZ	1.57	21.32	22.89	3839
	Mentzelia pumila (Nutt.) Torr. & Gray	Golden blazing star	UT	1.50	17.03	18.53	3929
	Mentzelia pumila (Nutt.) Torr. & Gray	Golden blazing star	CO	1.74	20.70	22.44	5639
	Mentzelia sinuata (Rydb.) Hill	Blazing star	CO	4.12	24.72	28.84	5247
	Mentzelia strictissima (Woot. & Standl.) J. Darl.	Blazing star	TX	2.65	18.41	21.06	4067
	Mentzelia thompsonii Glad	Blazing star	CO	1.33	14.72	16.05	5239
	Petalonyx nitidus S. Wats.	Sandpaper plant	NV	1.35	16.74	18.09	3865
	Petalonyx thurberi Gray	Sandpaper plant	AZ	1.65	29.77	31.42	4023
Loganiaceae	Buddleja marrubiifolia Benth.	Wooly butterflybush	TX	2.70	21.76	24.46	3551
	Buddleja scordioides H.B.K.	Escobilla	TX	1.97	20.81	22.78	5221
Malvaceae	Hibiscus denudatus Benth.	Rose mallow	TX	1.16	8.45	9.61	5181
	Sphaeralcea ambigua Gray	Desert globemallow	NV	1.13	15.03	16.16	3895

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Malvaceae	Sphaeralcea angustifolia (Cav.) G. Don	Narrowleaf globemallow	TX	2.69	14.32	17.01	4036
	Sphaeralcea coccinea ssp. dissecta (Nutt.) Kearney	Scarlet globemallow	CO	1.23	14.95	16.18	3998
	Sphaeralcea fendleri Gray	Fendler's mallow	NM	2.59	16.46	19.05	4349
Martyniaceae	Proboscidea fragrans (Lindl.) Dcne.	Unicorn plant	TX	8.46	22.40	30.86	5182
	Proboscidea louisianica (P. Mill.) Thellung	Devil's claw	CO	4.01	14.73	18.74	4297
Moraceae	Humulus lupulus L.	Wild hops	CO	2.83	15.63	18.46	4296
Nyctaginaceae	Abronia elliptica A. Nels.	Pink sand verbena	UT	2.34	13.01	15.35	3915
	Abronia elliptica A. Nels.	Snowball sand verbena	CO	1.87	24.35	26.22	4000
	Abronia fragrans Nutt. ex Hook.	Prairie sand verbena	CO	1.79	17.25	19.04	4224
	Anulocaulis gypsogenus Waterfall	Gyp ringstem	TX	1.21	11.82	13.03	4070
	Mirabilis bigelovii Gray	Wishbone four-o'clock	AZ	2.72	19.37	22.09	5632
	Mirabilis linearis (Pursh) Heimerl	Fringe-cup four-o'clock	CO	1.41	13.92	15.33	4535
	Mirabilis multiflora (Torr.) Gray	Colorado four-o'clock	CO	2.50	20.64	23.14	4492
	Mirabilis multiflora (Torr.) Gray	Colorado four-o'clock	TX	3.08	23.53	26.61	4080
	Mirabilis multiflora (Torr.) Gray	Colorado four-o'clock	AZ	2.15	18.50	20.65	4027
	Mirabilis multiflora (Torr.) Gray	Colorado four-o'clock	CO	1.06	18.12	19.18	4341
Oleaceae	Forestiera neomexicana Gray	Spring herald	TX	1.98	26.46	28.44	4077
	Fraxinus anomala Torr. ex S. Wats.	Singleleaf ash	CO	1.60	28.75	30.35	4002
Onagraceae	Calylophus hartwegii ssp. maccartii (Shin.) Tow. & Raven	Evening primrose	TX	1.64	25.56	27.20	4084
	Camissonia claviformis (Torr. & Frem.) Raven	Evening primrose	NV	2.20	18.88	21.08	3890
	Epilobium paniculatum Nutt. ex Torr. & Gray	Autumn willowweed	OR	2.65	21.98	24.63	3404
	Gaura parviflora Dougl.	Lizard tail	CO	2.81	11.37	14.18	4232
	Gaura villosa Torr.	Woolly gaura	TX	2.67	12.09	14.76	4126
Papaveraceae	Argemone corymbosa ssp. arenicola Ownbey	Prickly poppy	UT	2.27	26.13	28.40	4507
	Argemone intermedia Sweet	Prickly poppy	AZ	2.98	21.31	24.29	3836
	Argemone munita Dur. & Hilg.	Hedgehog prickly poppy	UT	1.73	15.72	17.45	3912
	Argemone polyanthemos (Fedde) Ownbey	Prickly poppy	CO	2.14	17.75	19.89	4302
	Argemone polyanthemos (Fedde) Ownbey	Prickly poppy	TX	2.50	17.08	19.58	4039
	Dendromecon rigida Benth.	Tree poppy	CA	2.50	18.47	20.97	4026
Poaceae	Elymus cinereus Scribn. & Merr.	Great Basin wild rye	OR	2.77	12.98	15.75	3409
Polemoniaceae	Collomia grandiflora Dougl. ex Lindl.	Big flower collomia	OR	3.95	23.13	27.08	3406
	Gilia mcvickerae M.E. Jones	Sticky gilia	CO	2.92	20.89	23.81	4268
	Ipomopsis aggregata (Pursh) V. Grant	Sky rocket gilia	CO	1.59	24.80	26.39	4344
	Ipomopsis congesta (Hook.) Grant	Ballhead gilia	UT	1.77	25.14	26.91	3909

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Polemoniaceae	Ipomopsis longiflora (Torr.) Grant	Long-flowered gilia	CO	1.21	20.05	21.26	4291
	Ipomopsis roseata (Rydb.) V. Grant	Gilia	UT	1.56	25.71	27.27	4495
Polygonaceae	Eriogonum annuum Nutt.	Wild buckwheat	CO	1.49	20.06	21.55	4272
	Eriogonum corymbosum var. glutinosum (Jones) Jones	Corymbed eriogonum	UT	1.51	23.67	25.18	4605
	Eriogonum corymbosum var. orbiculatum (Stokes)R.& B.	Corymbed eriogonum	UT	1.34	24.27	25.61	4611
	Eriogonum fasciculatum Benth.	Flattop eriogonum	AZ	1.60	24.46	26.06	4113
	Eriogonum inflatum Torr. & Frem.	Desert trumpet	NV	2.05	20.68	22.73	3896
	Eriogonum microthecum Nutt.	Wild buckwheat	CO	1.45	17.35	18.80	4538
	Eriogonum microthecum var. laxiflorum Hook.	Wild buckwheat	ID	1.02	18.33	19.35	4360
	Eriogonum saurinum Reveal	Wild buckwheat	UT	1.78	21.06	22.84	4375
	Eriogonum strictum ssp. proliferum (T. & G.) Stokes	Wild buckwheat	OR	1.79	22.40	24.19	3411
	Eriogonum viridulum Reveal	Wild buckwheat	UT	1.96	22.75	24.71	4376
	Eriogonum wrightii Torr.	Wild buckwheat	AZ	1.41	15.26	16.67	5644
	Polygonum lapathifolium L.	Curly-top ladies thumb	CO	1.71	16.37	18.08	4326
	Polygonum pensylvanicum (L.) Small	Pennsylvania smartweed	CO	1.57	16.15	17.72	4280
	Rumex acetosella L.	Sheep sorrel	CO	1.50	22.02	23.52	4752
	Rumex acetosella L.	Sheep sorrel	WA	1.13	16.46	17.59	5302
	Rumex altissimus Wood	Great dock	KS	0.51	18.73	19.24	5274
	Rumex crispus L.	Curly dock	UT	2.28	22.89	25.17	3834
	Rumex crispus L.	Curly dock	WA	0.55	11.91	12.46	3946
	Rumex densiflorus Osterhout	Dense-flowered dock	CO	0.89	21.09	21.98	5289
	Rumex hymenosepalus Torr.	Wild rhubarb; Cañaigre	NV	1.80	21.56	23.36	4694
	Rumex occidentalis S. Wats.	Western dock	CO	1.10	22.83	23.93	5254
	Rumex triangulivalvis (Danser) Rech. f.	Willow dock	OR	1.20	17.28	18.48	5314
	Rumex triangulivalvis (Danser) Rech. f.	Willow dock	CO	1.32	11.84	13.16	4275
	Rumex venosus Pursh	Veiny dock	WA	1.40	31.87	33.27	3955
Ranunculaceae	Clematis drummondii Torr. & Gray	Texas virgin's bower	TX	2.56	20.25	22.81	3571
	Clematis ligusticifolia Nutt.	Western virgin's bower	CO	1.67	27.19	28.86	4392
	Clematis ligusticifolia Nutt.	Western virgin's bower	CO	2.31	23.85	26.16	4541
	Delphinium geyeri Greene	Geyer's delphinium	CO	2.36	21.30	23.66	4300
Rhamnaceae	Ceanothus fendleri Gray	Fendler buckbrush	AZ	2.33	19.37	21.70	4013
	Ceanothus velutinus Dougl. ex Hook.	Mountain lilac	CO	5.22	30.80	36.02	4397
	Ceanothus velutinus Dougl. ex Hook.	Mountain lilac	CO	2.32	25.95	28.27	5265(R)
	Condalia ericoides (Gray) M.C. Johnston	Javelina bush	TX	1.50	11.30	12.80	4040
	Ziziphus jujuba Mill.	Jujube	TX	4.24	19.95	24.19	5186
Rosaceae	Adenostoma fasciculatum Hook. & Arn.	Greasewood	CA	4.47	29.05	33.52	4018
	Amelanchier alnifolia (Nutt.) Nutt.	Common serviceberry	WA	2.41	20.05	22.46	3935

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Rosaceae	Amelanchier utahensis Koehne	Utah serviceberry	NV	1.66	17.28	18.94	3897
	Amelanchier utahensis Koehne	Utah serviceberry	CO	2.76	18.63	21.39	4005
	Cercocarpus ledifolius var. intricatus (Wats.) Jones	Little-leaf mountain mahogany	CO	5.83	19.83	25.66	4004
	Cercocarpus montanus Raf.	Mountain mahogany	CO	2.70	21.79	24.49	3992
	Cercocarpus montanus Raf.	Mountain mahogany	CO	2.46	17.60	20.06	4230
	Coleogyne ramosissima Torr.	Blackbrush	UT	3.55	14.24	17.79	4504
	Cowania mexicana D. Don	Cliffrose	NV	3.27	13.99	17.26	3868
	Cowania mexicana D. Don	Cliffrose	CO	4.01	26.83	30.84	3993
	Cowania mexicana D. Don	Cliffrose	UT	4.40	18.36	22.76	3822
	Cowania mexicana D. Don	Cliffrose	AZ	3.28	20.84	24.12	4022
	Crataegus columbiana T.J. Howell	Hawthorn	WA	2.21	18.69	20.90	3947
	Crataegus crus-galli L.	Cockspur hawthorn	TX	2.79	18.08	20.87	5222
	Fallugia paradoxa (D. Don) Endl.	Apache plume	AZ	3.03	18.11	21.14	4030
	Fallugia paradoxa (D. Don) Endl.	Apache plume	NM	3.52	23.04	26.56	4399
	Peraphyllum ramosissimum Nutt.	Squaw-apple	CO	2.49	23.33	25.82	4501
	Potentilla fruticosa L.	Shrubby cinquefoil	MT	2.50	9.22	11.72	4379
	Prunus andersonii Gray	Anderson peachbrush	NV	1.51	11.14	12.65	3870
	Prunus andersonii Gray	Anderson peachbrush	CA	1.20	16.62	17.82	3908
	Prunus virginiana L.	Western chokecherry	NV	1.56	9.28	10.84	3871
	Prunus virginiana L.	Western chokecherry	CO	1.67	26.28	27.95	4493
	Prunus virginiana var. melanocarpa (A. Nels.) Sarg.	Western chokecherry	WA	2.24	29.03	31.27	3931
	Purshia tridentata (Pursh) DC.	Antelope bitterbrush	CO	3.22	19.04	22.26	4409
	Purshia tridentata (Pursh) DC.	Antelope bitterbrush	CO	2.88	22.67	25.55	4502
	Purshia tridentata (Pursh) DC.	Antelope bitterbrush	WA	2.54	17.26	19.80	3960
	Purshia tridentata (Pursh) DC.	Antelope bitterbrush	UT	2.10	12.40	14.50	3924
	Rosa woodsii Lindl.	Woods' rose	CA	1.90	24.02	25.92	3922
	Rosa woodsii Lindl.	Woods' rose	WA	2.64	25.69	28.33	3937
	Rosa woodsii Lindl.	Woods' rose	AZ	2.57	26.37	28.94	4014
	Vauquelinia californica (Torr.) Sarg.	Arizona rosewood	AZ	3.48	25.25	28.73	4099
Rubiaceae	Cephalanthus occidentalis L.	Button-bush	AZ	2.20	19.79	21.99	4116
Rutaceae	Thamnosma montana Torr. & Frem.	Mojave desert rue	UT	6.23	21.21	27.44	3821
Salicaceae	Salix exigua Nutt.	Sandbar willow	CA	1.76	12.98	14.74	3904
Santalaceae	Comandra umbellata ssp. pallida (DC.) Piehl	Bastard toadflax	AZ	3.33	25.23	28.56	5145
Sapindaceae	Dodonaea viscosa (L.) Jacq.	Switch-sorrel	AZ	5.41	19.71	25.12	4117
	Sapindus drummondii Hook. & Arn.	Soapberry	TX	1.69	21.27	22.96	5176
Saururaceae	Anemopsis californica (Nutt.) Hook. & Arn.	Yerba-mansa	CA	2.21	30.97	33.18	3876
	Anemopsis californica (Nutt.) Hook. & Arn.	Yerba-mansa	CA	2.81	32.19	35.00	4695(R)

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Saxifragaceae	Fendlera rupicola Gray	Cliff fendlerbush	CO	5.29	18.92	24.21	3991
	Philadelphus lewisii Pursh	Lewis' mockorange	WA	4.77	21.39	26.16	3932
	Ribes aureum Pursh	Golden currant	WA	1.92	30.89	32.81	3952
	Ribes cereum Dougl.	Wax currant	CO	3.60	24.40	28.00	4301
	Ribes inerme Rydb.	Whitestem gooseberry	CO	2.86	18.34	21.20	4760
	Ribes leptanthum Gray	Trumpet gooseberry	WY	1.49	17.79	19.28	5261
	Ribes montigenum McClatchie	Gooseberry currant	WY	2.02	16.14	18.16	5248
	Ribes montigenum McClatchie	Gooseberry currant	OR	1.87	15.85	17.72	5313
	Ribes viscosissimum Pursh	Sticky currant	OR	1.88	16.62	18.50	5312
Scrophulariaceae	Castilleja chromosa A. Nels.	Desert paintbrush	NV	1.24	28.14	29.38	3894
	Castilleja lanata Gray	Indian paintbrush	TX	1.11	24.41	25.52	4035
	Cordylanthus kingii S. Wats.	King's birdsbeak	UT	0.85	24.46	25.31	4610
	Cordylanthus ramosus Nutt. ex Benth.	Bush birdsbeak	OR	2.72	34.41	37.13	3410
	Leucophyllum minus Gray	Big bend silverleaf	TX	4.33	25.18	29.51	3559
	Linaria genistifolia ssp. dalmatica (L.) Mai. & Pet.	Dalmatian toadflax	WA	1.93	29.26	31.19	3962
	Linaria vulgaris P. Mill.	Butter & eggs toadflax	MT	2.13	30.60	32.73	4364
	Linaria vulgaris P. Mill.	Butter & eggs toadflax	MT	2.15	29.74	31.89	5124(R)
	Mimulus guttatus Fisch. ex DC.	Yellow monkeyflower	WA	1.33	13.83	15.16	3941
	Penstemon alpinus Torr.	Alpine beardstongue	CO	1.26	24.48	25.74	4754
	Penstemon ambiguus ssp. laevissimus (Keck) Holm.	Gilia penstemon	UT	1.26	26.60	27.86	4509
	Penstemon angustifolius ssp. caudatus (Heller) Rydb.	Narrowleaf penstemon	NM	1.52	20.15	21.67	5242
	Penstemon angustifolius var. venosus (Keck) Holm.	Narrowleaf penstemon	UT	1.93	16.58	18.51	3923
	Penstemon barbatus (Cav.) Roth	Beardlip penstemon	AZ	1.41	20.39	21.80	4115
	Penstemon caespitosus Nutt. ex Gray	Mat penstemon	CO	0.95	23.05	24.00	5245
	Penstemon confertus Dougl.	Yellow penstemon	WA	1.04	23.99	25.03	5610
	Penstemon cyanocaulis Payson	Penstemon	CO	0.95	29.04	29.99	4494
	Penstemon eatonii Gray	Eaton's penstemon	UT	1.31	22.91	24.22	4708
	Penstemon eatonii ssp. undosus (Jones) Keck	Eaton's penstemon	UT	0.82	25.76	26.58	5294
	Penstemon fremontii Torr. & Gray	Fremont's penstemon	UT	1.34	28.98	30.32	5571
	Penstemon humilis Nutt.	Low penstemon	CO	0.60	14.50	15.10	5573
	Penstemon lentus Pennell	Beardstongue	NM	1.50	29.40	30.90	5240
	Penstemon linarioides ssp. coloradoensis (Nels.) Keck	Toadflax penstemon	NM	1.13	25.42	26.55	5241
	Penstemon linarioides ssp. sileri (Gray) Keck	Toadflax penstemon	UT	1.15	18.18	19.33	4710
	Penstemon moffattii Eastw.	Moffatt's penstemon	CO	0.89	22.81	23.70	3997
	Penstemon osterhoutii Pennell	Osterhout's penstemon	CO	1.49	27.55	29.04	4550
	Penstemon pachyphyllus Gray	Thickleaf penstemon	UT	1.61	29.25	30.86	5653
	Penstemon palmeri Gray	Palmer's penstemon	UT	1.29	25.03	26.32	3920
	Penstemon procerus Dougl. ex Graham	Littleflower penstemon	WY	1.15	23.20	24.35	4759

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Scrophulariaceae	Penstemon strictiformis Rydb.	Penstemon	NM	0.89	33.81	34.70	5290
	Penstemon strictus Benth.	Rocky mountain penstemon	NM	0.83	33.73	34.56	5243
	Penstemon strictus Benth.	Rocky mountain penstemon	WY	0.93	24.46	25.39	5273
	Penstemon triphyllus Dougl.	Three-leaved penstemon	WA	0.90	19.37	20.27	5305
	Penstemon virens Pennell	Green penstemon	CO	2.75	24.06	26.81	4749
	Penstemon virgatus ssp. asa-grayi Crosswhite	Wandbloom penstemon	CO	1.16	34.39	35.55	4404
	Penstemon virgatus ssp. asa-grayi Crosswhite	Wandbloom penstemon	CO	1.08	30.33	31.41	4744(R)
	Penstemon whippleanus Gray	Whipple's penstemon	CO	1.54	30.29	31.83	4751
	Penstemon whippleanus Gray	Whipple's penstemon	CO	0.48	18.18	18.66	5651
	Verbascum blattaria L.	Moth mullein	OR	3.47	18.84	22.31	4441
	Verbascum thapsus L.	Flannel mullein	CO	1.07	17.58	18.65	4394
Solanaceae	Datura innoxia P. Mill.	Indian-apple; Sacred datura	AZ	2.22	21.18	23.40	3838
	Datura innoxia P. Mill.	Indian-apple; Sacred datura	NV	2.20	19.97	22.17	3900
	Datura quercifolia H.B.K.	Oakleaf thorn-apple	TX	1.56	24.50	26.06	5205
	Datura stramonium L.	Jimson weed	CO	8.27	15.78	24.05	4391
	Datura stramonium L.	Jimson weed	CO	4.20	19.03	23.23	5276(R)
	Lycium fremontii Gray	Desert thorn	AZ	2.07	12.00	14.07	5629
	Nicotiana glauca Graham	Tree tobacco	AZ	7.06	14.53	21.59	4163
	Nicotiana trigonophylla Dunal	Desert tobacco	AZ	5.13	17.92	23.05	3841
	Physalis subulata Rydb.	Ground-cherry	TX	4.32	18.25	22.57	5175
	Physalis virginiana var. sonorae (Torr.) Waterfall	Popweed; Virginia groundcherry	NE	2.50	24.39	26.89	4281
	Physalis virginiana var. sonorae (Torr.) Waterfall	Popweed; Virginia groundcherry	CO	4.29	21.23	25.52	4537
	Solanum cornutum Lam.	Buffalo bur	NE	1.69	19.06	20.75	4282
	Solanum cornutum Lam.	Buffalo bur	AZ	2.44	16.29	18.73	4103
	Solanum elaeagnifolium Cav.	Silverleaf horsenettle	AZ	1.83	16.69	18.52	3840
	Solanum elaeagnifolium Cav.	Silverleaf horsenettle	CO	1.53	17.23	18.76	4226
Tamaricaceae	Tamarix aphylla (L.) Karst.	Athel tamarisk	UT	1.90	15.90	17.80	3820
	Tamarix chinensis Lour.	Tamarisk	TX	2.23	17.18	19.41	4129
	Tamarix ramosissima L.	Salt cedar; Tamarisk	UT	1.44	14.32	15.76	4721
Urticaceae	Urtica dioica ssp. gracilis var. holosericea (Nutt.) C.L. Hitchc.	Slim stinging nettle	WA	5.77	10.87	16.64	4449
Verbenaceae	Aloysia gratissima (Gill. & Hook.) Troncoso	Common beebrush	TX	1.67	11.02	12.69	3581
	Aloysia wrightii (Gray) Heller	Oreganillo	AZ	1.36	10.33	11.69	5612
	Glandularia bipinnatifida (Nutt.) Nutt.	Mexican vervain	AZ	2.67	16.30	18.97	4119
	Verbena stricta Vent.	Erect verbena	CO	1.23	23.56	24.79	4353
Vitaceae	Vitis arizonica Engelm.	Canyon grape	AZ	2.31	14.99	17.30	4011
Zygophyllaceae	Guaiacum angustifolium Engelm.	Narrowleaf guaiacum	TX	3.00	18.50	21.50	4127
	Larrea tridentata (Sesse & Moc. ex DC.) Coville	Creosote bush	CA	4.87	23.55	28.42	3494

Family	Scientific Name	Common Name	Location[a]	% Hexane	% MeOH	% Total Yield	Plant #
Zygophyllaceae	Larrea tridentata (Sesse & Moc. ex DC.) Coville	Creosote bush	TX	4.66	27.88	32.54	3556
	Peganum harmala L.	Harmal peganum	TX	2.58	25.00	27.58	4046
	Tribulus terrestris L.	Puncturevine	CO	0.94	13.14	14.08	4352

[a]Location key (by State): AZ = Arizona; CA = California; CO = Colorado; ID = Idaho; KS = Kansas; MT = Montana; NC = North Carolina; ND = North Dakota; NE = Nebraska; NM = New Mexico; NV = Nevada; OR = Oregon; SD = South Dakota; TX = Texas; UT = Utah; WA = Washington; WY = Wyoming.