Supplementary Materials

Table S1. Number of study sites on photodegradation in different countries. Note that two studies* includes studies from more than one country.

Country	Number of study sites
Argentine	7
Australia	1
Brazil	1
Chile	1
China	13
Finland	1
France	2
India	1
Israel	1
*Israel, Italy, Spain	1
Japan	1
Netherlands	1
New Zealand	2
*Norway, Sweden, Netherlands, Greece	1
Russia	1
Spain	2
Sweden	2
UK	4
USA	26
	69

Table S2. Number of studies with different duration (number of days) in experimental photodegradation studies.

Number of days	Number of studies
0-99	8
100-200	11
200-300	8
300-400	15
400-500	9
500-600	1
600-700	2
700-800	6
800-900	3
900-1000	1
1000-2000	3
3000-4000	2

Table S3. Number of litter (plant) species used in photodegradation studies.

No. of species	Number of studies	%
1	24	34.8
2	21	30.4
3	13	18.8
4	1	1.4
5	3	4.3
6	3	4.3
8	1	1.4
12	2	2.9
23	1	1.4

Table S4. List of litter (plant) species used in studies (number of studies & percentage), plant functional group, plant family.

Abbreviation	Plant species name	Number of studies	%	Functional plant group	Family
A. auracana	Araucaria auracana	1.0	0.5	tree	Araucariaceae
A. bracteata	Atraphaxis bracteata	1.0	0.5	shrub	Polygonaceae
A. calamus	Acorus calamus	1.0	0.5	forb	Acoraceae
A. carpinifolium	Acer carpinifolium	1.0	0.5	tree	Sapindaceae
A. coriacea	Acacia coriacea	1.0	0.5	tree	Fabaceae
A. deltoidea	Ambrosia deltoidea	3.0	1.5	shrub	Asteraceae
A. fatua	Avena fatua	2.0	1.0	grass	Poaceae
A. gerardi	Andropogon gerardi	2.0	1.0	grass	Poaceae
A. longiseta	Aristida longiseta	1.0	0.5	grass	Poaceae
A. ordosica	Artemisia ordosica	1	0.5	shrub	Asteraceae
A. pungens	Agriophyllum pungens	1	0.5	forb	Amaranthaceae
A. purpurea	Aristida purpurea	1	0.5	grass	Poaceae
A. rubrum L.	Acer rubrum	1	0.5	tree	Sapindaceae
A. saccharum	Acer saccharum	1	0.5	tree	Sapindaceae
A. sterilis	Avena sterilis	2	1.0	grass	Poaceae
B. diandrus	Bromus diandrus	3	1.5	grass	Poaceae
B. eriopoda	Bouteloua eriopoda	2	1.0	grass	Poaceae
B. gracilis	Bouteloua gracilis	4	2.1	grass	Poaceae
B. multiradiata	Baileya multiradiata	1	0.5	shrub	Asteraceae
B. pendula	Betula pendula	1	0.5	tree	Betulaceae
B. pictus	Bromus pictus	1	0.5	grass	Poaceae
B. platyphylla	Betula platyphylla	1	0.5	tree	Betulaceae
B. pubescens	Betula pubescens	1	0.5	tree	Betulaceae
B. rubens L.	Bromus rubens L.	1	0.5	grass	Poaceae
C. acanthoides	Carduus acanthoides	1	0.5	forb	Asteraceae
C. arenaria	Carex arenaria	1	0.5	grass	Cyperaceae
C. camphora	Cinnamomum camphora	3	1.5	tree	Lauraceae
C. chinganicum	Corispermum chinganicum	1	0.5	forb	Amaranthaceae
C. citratus	Cymbopogon citratus	1	0.5	grass	Poaceae
C. culeou	Chusquea culeou	1	0.5	grass	Poaceae
C. dactylon	Cynodon dactylon	3	1.5	grass	Poaceae
C. epigejos	Calamagrostis epigejos	1	0.5	grass	Poaceae
C. fortunei	Cryptomeria fortunei	1	0.5	tree	Cupressaceae
C. glauca	Cyclobalanopsis glauca	1	0.5	tree	Fagaceae
C. korshinskii	Caragana korshinskii	2	1.0	shrub	Fabaceae
C. lanceolata	Cunninghamia lanceolata	3	1.5	tree	Cupressaceae
C. monspeliensis	Cistus monspeliensis	1	0.5	shrub	Cistaceae
C. pseudophragmites	Calamagrostis pseudophragmites	1	0.5	grass	Poaceae

C. squarrosa	Cleistogenes squarrosa	1	0.5	grass	Poaceae
C. vesicaria	Crepis vesicaria	1	0.5	forb	Asteraceae
C. villosa	Calicotome villosa	1	0.5	shrub	Fabaceae
D. Glauca	Drypetes Glauca	1	0.5	tree	Putranjivaceae
D. glomerata	Dactylis glomerata	1	0.5	grass	Poaceae
D. pentaphyllum	Dorycnium pentaphyllum	1	0.5	shrub	Fabaceae
E. camaldulensis subsp. Refulgens	Eucalyptus camaldulensis subsp. Refulgens	1	0.5	tree	Myrtaceae
E. curvula	Eragrostis curvula	1	0.5	grass	Poaceae
E. farinosa A.	Encelia farinosa A.	1	0.5	shrub	Asteraceae
E. frutescens	Encelia frutescens	1	0.5	shrub	Asteraceae
E. glaucus	Elymus glaucus	1	0.5	grass	Poaceae
E. oxyrrhynchum	Erodium oxyrrhynchum	1	0.5	forb	Geraniaceae
F. americana	Fraxinus americana	1	0.5	tree	Oleaceae
F. camtschatica	Filipendula camtschatica	1	0.5	forb	Rosaceae
F. crenata Blume	Fagus crenata Blume	1	0.5	tree	Fagaceae
F. excelsior	Fraxinus excelsior	2	1.0	tree	Oleaceae
F. hieronymi	Festuca hieronymi	1	0.5	grass	Poaceae
F. japonica	Fallopia japonica	1	0.5	forb	Polygonaceae
F. sylvatica	Fagus sylvatica	3	1.5	tree	Fagaceae
G. magellanica	Gunnera magellanica	1	0.5	forb	Gunneraceae
G. max	Glycine max	1	0.5	forb	Fabaceae
H. ammodendron	Haloxylon ammodendron	2	1.0	shrub	Amaranthaceae
H. annuus	Helianthus annuus	1	0.5	forb	Asteraceae
H. italicum	Helichrysum italicum	1	0.5	shrub	Asteraceae
H. laeve	Hedysarum laeve	1	0.5	shrub	Fabaceae
H. lanatus L	Holcus lanatus L.	1	0.5	forb	Poaceae
H. sieboldiana	Hosta sieboldiana	1	0.5	grass	Asparagaceae
H. vulgare L.	Hordeum vulgare L	1	0.5	grass	Poaceae
J. monosperma	Juniperus monosperma	3	1.5	shrub	Cupressaceae
L. divaricata	Larrea divaricata.	1	0.5	shrub	Zygophyllaceae
Larrea tridentata	Larrea tridentata	1	0.5	shrub	Zygophyllaceae
L. latifolium	Lepidium latifolium	1	0.5	shrub	Brassicaceae
L. multiflorum	Lolium multiflorum	2	1.0	grass	Poaceae
L. obtusiloba Blume	Lindera obtusiloba Blume	1	0.5	forb	Lauraceae
L. perenne cv Nui	Lolium perenne cv Nui)	1	0.5	grass	Poaceae
L. scopariumm	Leptospermum scoparium	1	0.5	shrub	Myrtaceae
L. tridentata	Larrea tridentata	3	1.5	shrub	Zygophyllaceae
M. argentea	Melaleuca argentea	1	0.5	tree	Myrtaceae
M. boaria	Maytenus boaria	1	0.5	tree	Celastraceae
M. giganteus	Miscanthus x giganteus	1	0.5	grass	Poaceae
M. spinosum	Mulinum spinosum	1	0.5	shrub	Apiaceae

N. antarctica	*Nothofagus antarctica*	1	0.5	tree	Nothofagaceae
N. dombeyi	*Nothofagus dombeyi*	1	0.5	tree	Nothofagaceae
N. nervosa	*Nothofagus nervosa*	1	0.5	tree	Nothofagaceae
N. obliqua	*Nothofagus obliqua*	1	0.5	tree	Nothofagaceae
N. tenuis	*Nassella tenuis*	1	0.5	grass	Poaceae
O. hymenoides	*Oryzopsis hymenoides*	1	0.5	grass	Poaceae
O. sativa	*Oryza sativa L.*	2	1.0	grass	Poaceae
O. tenuiflorum	*Ocimum tenuiflorum*	1	0.5	shrub	Lamiaceae
O. tesota A	*Olneya tesota A*	1	0.5	tree	Fabaceae
P. australis	*Phragmites australis*	1	0.5	tree	Poaceae
P. centrasiaticum	*Pennisetum centrasiaticum*	1	0.5	grass	Poaceae
P. chilensis	*Porlieria chilensis*	1	0.5	grass	Zygophyllaceae
P. deltoides	*Populus deltoides sub. Wislizeni*	1	0.5	shrub	Salicaceae
P. edulis	*Pinus edulis*	1	0.5	tree	Pinaceae
P. glandulosa	*Prosopis glandulosa*	2	1.0	tree	Fabaceae
P. ligularis	*Poa ligularis*	3	1.5	shrub	Poaceae
p. massoniana	*Pinus massoniana*	2	1.0	grass	Pinaceae
P. nigra	*Populus nigra*	2	1.0	tree	Salicaceae
P. ponderosa	*Pinus ponderosa*	2	1.0	tree	Pinaceae
P. pubescens	*Phyllostachys pubescens*	1	0.5	tree	Poaceae
P. pungens	*Proustia pungens*	1	0.5	shrub	Asteraceae
P. quadrifarium	*Paspalum quadrifarium*	1	0.5	grass	Poaceae
P. radiata	*Pinus radiata*	2	1.0	tree	Pinaceae
P. resinosa	*Pinus resinosa*	1	0.5	tree	Pinaceae
P. sylvestris var. mongolica	*Pinus sylvestris var. mongolica*	1	0.5	tree	Pinaceae
P. tremuloides	*Populus tremuloides*	1	0.5	tree	Salicaceae
P. trilobata	*Pertya trilobata*	1	0.5	forb	Asteraceae
P. velutina	*Prosopis velutina*	4	2.1	tree	Fabaceae
P. villosa	*Psammochloa villosa*	1	0.5	grass	Poaceae
P. Xiaozhuanica	*Populus X xiaozhuanica*	1	0.5	tree	Salicaceae
Q. acutissima	*Quercus acutissima*	1	0.5	tree	Fagaceae
Q. crispula Blume	*Quercus crispula Blume*	1	0.5	tree	Fagaceae
Q.douglasii	*Quercus douglasii*	1	0.5	tree	Fagaceae
Q. ellipsoidalis	*Quercus ellipsoidalis*	1	0.5	tree	Fagaceae
Q. macrocarpa	*Quercus macrocarpa*	1	0.5	tree	Fagaceae
Q. prinus	*Quercus prinus*	1	0.5	tree	Fagaceae
Q. robur	*Quercus robur*	4	2.1	tree	Fagaceae
R. sphaerocarpa	*Retama sphaerocarpa*	1	0.5	shrub	Fabaceae
S. arabicus	*Schismus arabicus*	1	0.5	grass	Poaceae
S. chinensis	*Schisandra chinensis*	1	0.5	forb	Schisandraceae
S. chinensis	*Simmondsia chinensis*	1	0.5	shrub	Simmondsiaceae

S. comata	*Stipa comata*	1	0.5	grass	Poaceae
S. humilis	*Stipa humilis*	1	0.5	grass	Poaceae
S. krylovii	*Stipa krylovii*	1	0.5	grass	Poaceae
S. mellifera	*Salvia mellifera*	1	0.5	shrub	Lamiaceae
S. officinale	*Sisymbrium officinale*	1	0.5	shrub	Brassicaceae
S. passerine	*Salsola passerine*	1	0.5	forb	Amaranthaceae
S. prolifera	*Scabiosa prolifera*	2	1.0	shrub	Dipsacaceae
S. psammophila	*Salix psammophila*	2	1.0	shrub	Salicaceae
S. santolinum	*Seriphidium santolinum*	1	0.5	shrub	Compositae
S. scoparium	*Schizachyrium scoparium*	1	0.5	grass	Poaceae
S. speciosa	*Stipa speciosa*	2	1.0	grass	Poaceae
S. tenacissima	*Stipa tenacissima*	2	1.0	grass	Poaceae
S. trichotoma	*Stipa trichotoma*	1	0.5	grass	Poaceae
Scheuchzeria peat	*Scheuchzeria peat*	1	0.5	forb	Scheuchzeriaceae
Sorghum bicolor cultivars	*Sorghum bicolor cultivars*	1	0.5	grass	Poaceae
Sph. Fuscum peat	*Sphagnum Fuscum peat*	1	0.5	NA	Sphagnaceae
Sph. Papillosum peat	*Sphagnum Papillosum peat*	1	0.5	NA	Sphagnaceae
T. aestivum	*Triticum aestivum*	3	1.5	grass	Poaceae
T. ciliata	*Toona ciliata*	1	0.5	tree	Meliaceae
T. plicata	*Thuja plicata*	1	0.5	tree	Cupressaceae
T. sellowiana	*Tibouchina sellowiana*	1	0.5	tree	Melastomataceaae
Tamarix Sp.	*Tamarix Sp.*	1	0.5	tree	Tamaricaceae
Tilia sp.	*Tilia sp.*	1	0.5	tree	Malvaceae
V. coignetiae	*Vitis coignetiae*	1	0.5	shrub	Vitaceae
V. myrtillus	*Vaccinium myrtillus*	1	0.5	shrub	Ericaceae
V. uliginosum	*Vaccinium uliginosum*	1	0.5	shrub	Ericaceae
Lespedeza bicolor Turcz. var. bicolor.	*Lespedeza bicolor Turcz. var. bicolor.*	1	0.5	shrub	Fabaceae
Z. mays	*Zea mays*	1	0.5	grass	Poaceae
148		195	100		

Table S5. Effect of photodegradation on Carbon & nutrient breakdown in plant litter.

Effect on mass loss/ climate	C loss positive (n)	C loss positive (%)	C loss negative (n)	C loss negative (%)	C loss no effect (n)	C loss no effect (%)	C loss NA
Arid	7	50	2	14	1	7	4
Semi-arid	7	35	0	0	2	10	11
Temperate	5	50	0	0	2	20	3
Subtropical	4	44	2	22	0	0	3
Lab condition	7	35	3	15	5	25	5
Total	30	41	7	10	10	14	26

Effect on mass loss/ climate	N loss positive (n)	N loss positive (%)	N loss negative (n)	N loss negative (%)	N loss no effect (n)	N loss no effect (%)	N loss NA
Arid	8	53	2	13	3	20	2
Semi-arid	7	28	3	12	10	40	5
Temperate	4	31	2	15	4	31	3
Subtropical	3	30	2	20	3	30	2
Lab condition	7	33	3	14	5	24	6
Total	29	37	12	15	25	32	18

Effect on mass loss/ climate	lignin loss positive (n)	lignin loss positive (%)	lignin loss negative (n)	lignin loss negative (%)	lignin loss no effect (n)	lignin loss no effect (%)	lignin loss NA
Arid	8	57	0	0	2	14	4
Semi-arid	8	42	2	11	3	16	7
Temperate	3	27	1	9	3	27	4
Subtropical	0	0	0	0	4	44	5
Lab condition	2	11	5	26	3	16	9
Total	21	29	8	11	15	21	29

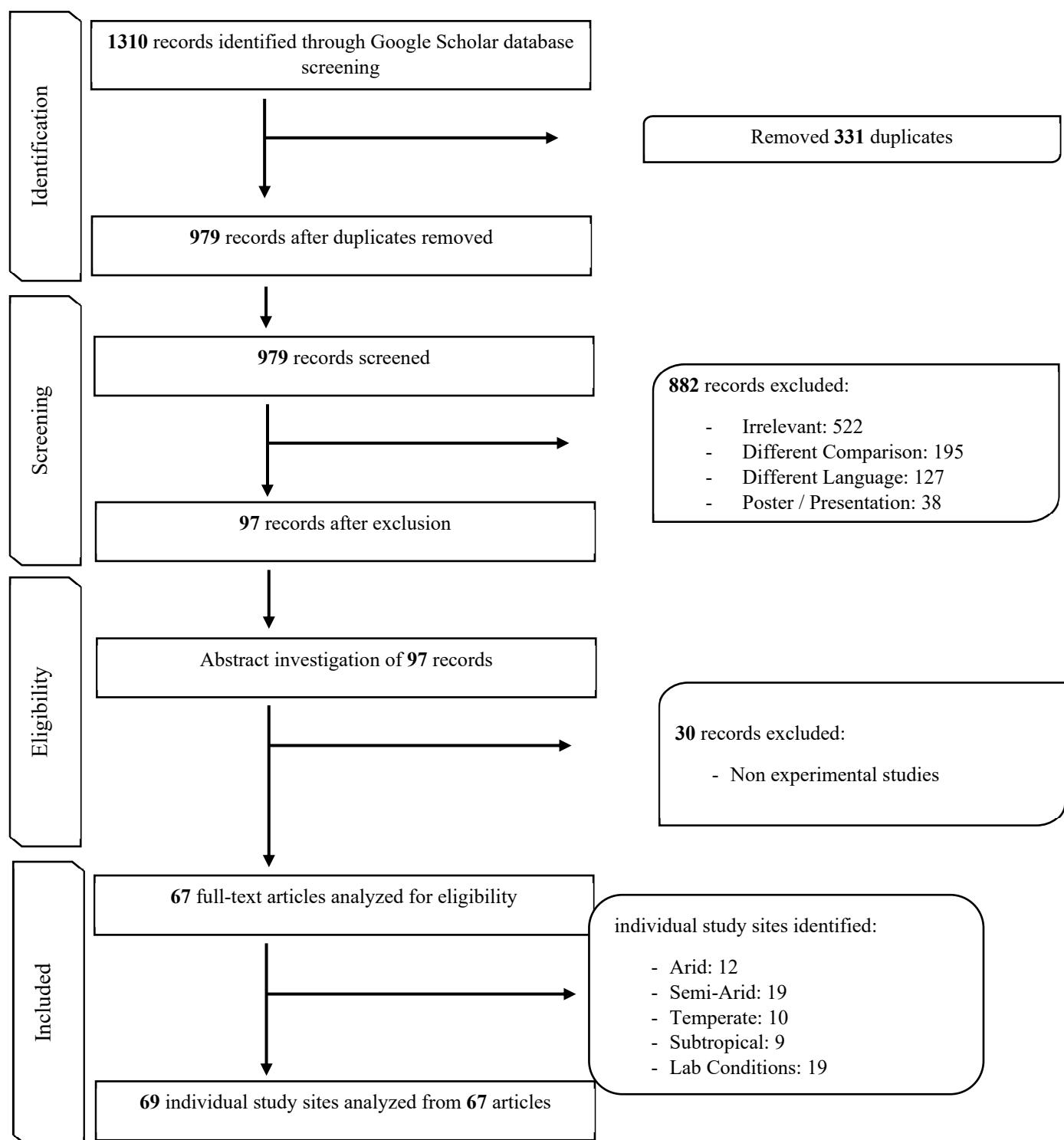**Figure S1**. Flowchart detailing the procedure implemented in this systematic review.

Figure S2. Percentage of litter from different plant functional groups used in photodegradation studies.