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附录I 荒漠一年生植物可异时萌发物种种类

Supplement I Species of desert annuals that can germinate at different times

| 科名                   | 属名                    | 种名                         | 萌发时间             | 分布地                                                                                            | 果实类型       | 休眠类型          | 参考文献                           |
|----------------------|-----------------------|----------------------------|------------------|------------------------------------------------------------------------------------------------|------------|---------------|--------------------------------|
| Family               | Genus                 | Species                    | Germination time | Distribution                                                                                   | Fruit type | Dormancy type | References                     |
| 十字花科<br>Brassicaceae | 庭芥属<br><i>Alyssum</i> | 条叶庭芥                       | 秋+春              | 西伯利亚、中亚、伊朗、巴基斯坦、印度北部、欧洲东部、中国新疆等                                                                | 短角果        | 生理休眠          | Mao & Zhang, 1994; Tang, 2016  |
|                      |                       | <i>Meniocus linifolius</i> | A+S              | Siberia, Central Asia, Iran, Pakistan, northern India, Eastern Europe, Xinjiang of China, etc. | Silicle    | PD            |                                |
|                      |                       | 荒漠庭芥(庭芥)                   | 秋+春              | 西伯利亚、中亚、蒙古、亚洲西部、欧洲东部、中国新疆等                                                                     | 短角果        | 不休眠           | Mao & Zhang, 1994; Zeng, 2011; |
|                      |                       | <i>Alyssum desertorum</i>  | A+S              | Siberia, Central Asia, Mongolia, Western Asia, Eastern Europe, Xinjiang of China, etc.         | Silicle    | ND            | Tang, 2016                     |
|                      |                       | 新疆庭芥                       | 秋+春              | 伊朗、欧洲、中亚、非洲、西伯利亚、中国新疆等                                                                         | 短角果        | 生理休眠          | Mao & Zhang, 1994; Tang, 2016  |
|                      |                       | <i>Alyssum simplex</i>     | A+S              | Iran, Europe, Central Asia, Africa, Siberia, Xinjiang of China, etc.                           | Silicle    | PD            |                                |
|                      |                       | 粗果庭芥                       | 秋+春              | 中国新疆、西伯利亚、印度、欧洲东部等                                                                             | 短角果        | 生理休眠          | Mao & Zhang, 1994; Tang, 2016  |
|                      |                       | <i>Alyssum dasycarpum</i>  | A+S              | Xinjiang of China, Siberia, India, Eastern Europe, etc.                                        | Silicle    | PD            |                                |
|                      |                       | 绵果芥属                       | 秋+春              | 中国新疆、中亚等                                                                                       | 短角果        | 不休眠           | Mao & Zhang, 1994; Mamut, 2011 |
|                      |                       | <i>Lachnoloma</i>          | A+S              | Xinjiang of China, Central Asia, etc.                                                          | Silicle    | ND            |                                |
|                      |                       | <i>lehmannii</i>           |                  |                                                                                                |            | 非深度生理休眠       |                                |
|                      |                       |                            |                  |                                                                                                |            | Nondeep PD    |                                |

| 附录I (续) Supplement I (continued) |                        |                            |                  |                                                                                                                   |            |               |                                                        |
|----------------------------------|------------------------|----------------------------|------------------|-------------------------------------------------------------------------------------------------------------------|------------|---------------|--------------------------------------------------------|
| 科名                               | 属名                     | 种名                         | 萌发时间             | 分布地                                                                                                               | 果实类型       | 休眠类型          | 参考文献                                                   |
| Family                           | Genus                  | Species                    | Germination time | Distribution                                                                                                      | Fruit type | Dormancy type | References                                             |
|                                  | 螺喙芥属                   | 螺喙芥                        | 秋+春              | 中国新疆、俄罗斯、阿富汗、伊朗等                                                                                                  | 短角果        | 非深度生理休眠       |                                                        |
|                                  | <i>Spirorhynchus</i>   | <i>Goldbachia sabulosa</i> | A+S              | Xinjiang of China, Russia, Afghanistan, Iran, etc.                                                                | Silicle    | Nondeep PD    | Mao & Zhang, 1994; Lu <i>et al.</i> , 2017             |
|                                  | 播娘蒿属                   | 播娘蒿                        | 秋+春              | 亚洲、欧洲、非洲及北美洲等                                                                                                     | 长角果        | 非深度生理休眠       | Baskin <i>et al.</i> , 2014; Tang, 2016                |
|                                  | <i>Descurainia</i>     | <i>Descurainia sophia</i>  | A+S              | Asia, Europe, Africa and North America                                                                            | Silique    | Nondeep PD    |                                                        |
|                                  |                        | 羽叶播娘蒿                      | 秋+春              | 北美、墨西哥、加拿大、阿根廷等                                                                                                   | 长角果        | 非深度生理休眠       | Forbis, 2010                                           |
|                                  |                        | <i>Descurainia pinnata</i> | A+S              | North America, Mexico, Canada, Argentina, etc.                                                                    | Silique    | Nondeep PD    |                                                        |
|                                  | 涩芥属                    | 涩芥                         | 秋+春              | 西班牙、美国、巴基斯坦、阿富汗、中国、法国、                                                                                            | 长角果        | 生理休眠          | Mao & Zhang, 1994; Tang, 2016                          |
|                                  | <i>Strigosella</i>     | <i>Malcolmia africana</i>  | A+S              | 非洲等                                                                                                               | Silique    | PD            |                                                        |
|                                  |                        |                            |                  | Spain, United States, Pakistan, Afghanistan, China, France, Africa, etc.                                          |            |               |                                                        |
|                                  |                        | 卷果涩芥                       | 秋+春              | 中国新疆、中亚、阿富汗、伊朗、巴基斯坦等                                                                                              | 长角果        | 物理+生理休眠       | Mao & Zhang, 1994; Fan <i>et al.</i> , 2010;           |
|                                  |                        | <i>Malcolmia</i>           | A+S              | Xinjiang of China, Central Asia, Afghanistan, Iran,                                                               | Silique    | PY+PD         | Tang, 2016                                             |
|                                  |                        | <i>scorpioides</i>         |                  | Pakistan, etc.                                                                                                    |            |               |                                                        |
|                                  | 菥蓂属                    | 菥蓂                         | 秋+春              | 亚洲、欧洲、非洲北部等                                                                                                       | 短角果        | 非深度生理休眠       | Sun <i>et al.</i> , 2007; Baskin <i>et al.</i> , 2014; |
|                                  | <i>Thlaspi</i>         | <i>Thlaspi arvense</i>     | A+S              | Asia, Europe, north Africa, etc.                                                                                  | Silicle    | Nondeep PD    | Yuan, 2020                                             |
|                                  | 大蒜芥属                   | 大蒜芥                        | 秋+春              | 中国(辽宁、新疆北部)、西伯利亚、中亚、伊朗、                                                                                           | 长角果        | 不休眠           | Xu <i>et al.</i> , 2012                                |
|                                  | <i>Sisymbrium</i>      | <i>Sisymbrium</i>          | A+S              | 阿富汗、印度、欧洲、北美洲等                                                                                                    | Silique    | ND            |                                                        |
|                                  |                        | <i>altissimum</i>          |                  | China (Liaoning, northern Xinjiang), Siberia, Central Asia, Iran, Afghanistan, India, Europe, North America, etc. |            |               |                                                        |
|                                  | 厚壁芥属                   | 厚壁芥                        | 秋+春              | 中国新疆、中亚、伊朗等                                                                                                       | 短角果        | 生理休眠          | Mao & Zhang, 1994; Qian, 2007                          |
|                                  | <i>Pachypterygium</i>  | <i>Isatis multicaulis</i>  | A+S              | Xinjiang of China, Central Asia, Iran, etc.                                                                       | Silicle    | PD            |                                                        |
|                                  | 无苞芥属                   | 无苞芥(小拟南芥)                  | 秋+春              | 中国新疆、俄罗斯、蒙古、阿富汗、巴基斯坦、伊                                                                                            | 长角果        | 物理+生理休眠       | Luo <i>et al.</i> , 2004                               |
|                                  | <i>Olimarabidopsis</i> | <i>Olimarabidopsis</i>     | A+S              | 朗等                                                                                                                | Silique    | PY+PD         |                                                        |

| 附录I (续) Supplement I (continued) |                       |                             |                  |                                                                                                   |            |               |                                            |
|----------------------------------|-----------------------|-----------------------------|------------------|---------------------------------------------------------------------------------------------------|------------|---------------|--------------------------------------------|
| 科名                               | 属名                    | 种名                          | 萌发时间             | 分布地                                                                                               | 果实类型       | 休眠类型          | 参考文献                                       |
| Family                           | Genus                 | Species                     | Germination time | Distribution                                                                                      | Fruit type | Dormancy type | References                                 |
|                                  |                       | <i>pumila</i>               |                  | Xinjiang of China, Russia, Mongolia, Afghanistan, Pakistan, Iran, etc.                            |            |               |                                            |
|                                  | 异果芥属                  | 异果芥                         | 秋+春              | 中国新疆北部、俄罗斯欧洲部分、高加索、中亚、                                                                            | 长角果        | 生理休眠          | Mao & Zhang, 1994; Lu <i>et al.</i> , 2014 |
|                                  | <i>Diptychocarpus</i> | <i>Diptychocarpus</i>       | A+S              | 伊朗、巴基斯坦等                                                                                          | Silique    | PD            |                                            |
|                                  |                       | <i>strictus</i>             |                  | Northern Xinjiang of China, European part of Russia, Caucasus, Central Asia, Iran, Pakistan, etc. |            |               |                                            |
|                                  | 丝叶芥属                  | 丝叶芥                         | 秋+春              | 中国新疆、高加索、中亚、伊朗、地中海东部及欧                                                                            | 长角果        | 非深度生理休眠       | Mao & Zhang, 1994; Lu <i>et al.</i> , 2016 |
|                                  | <i>Leptaleum</i>      | <i>Leptaleum filifolium</i> | A+S              | 洲东部等                                                                                              | Silique    | Nondeep PD    |                                            |
|                                  |                       |                             |                  | Xinjiang of China, Caucasus, Central Asia, Iran, Eastern Mediterranean and Eastern Europe         |            |               |                                            |
|                                  | 舟果芥属                  | 舟果芥                         | 秋+春              | 中国(新疆、西藏西部)、高加索、中亚、西伯利亚                                                                           | 短角果        | 非深度生理休眠       | Mao & Zhang, 1994; Lu <i>et al.</i> , 2017 |
|                                  | <i>Tauscheria</i>     | <i>Isatis gymnocarpa</i>    | A+S              | 及蒙古                                                                                               | Silicle    | Nondeep PD    |                                            |
|                                  |                       |                             |                  | China (Xinjiang, western Xizang), Caucasus, Central Asia, Siberia and Mongolia                    |            |               |                                            |
|                                  | 独行菜属                  | 抱茎独行菜                       | 秋+春              | 中国(新疆、甘肃、辽宁)、土耳其、西伯利亚、中                                                                           | 短角果        | 非深度生理休眠       | Mao & Zhang, 1994; Tang, 2016              |
|                                  | <i>Lepidium</i>       | <i>Lepidium perfoliatum</i> | A+S              | 亚、蒙古、伊朗和印度                                                                                        | Silicle    | Nondeep PD    |                                            |
|                                  |                       |                             |                  | China (Xinjiang, Gansu, Liaoning), Turkey, Siberia, Central Asia, Mongolia, Iran and India        |            |               |                                            |
|                                  |                       | 柱毛独行菜                       | 秋+春              | 中国、俄罗斯、蒙古、欧洲、亚洲西部、北美                                                                              | 短角果        | 生理休眠          | Clauss, 2000; Graeber, 2013                |
|                                  |                       | <i>Lepidium ruderae</i>     | A+S              | China, Russia, Mongolia, Europe, Western Asia, North America                                      | Silicle    | PD            |                                            |
|                                  | 菘蓝属                   | 宽翅菘蓝                        | 秋+春              | 中国新疆、中亚                                                                                           | 短角果        | 生理休眠          | Mao & Zhang, 1994; Zhou, 2015              |
|                                  | <i>Isatis</i>         | <i>Isatis violascens</i>    | A+S              | Xinjiang of China, Central Asia                                                                   | Silicle    | PD            |                                            |
|                                  |                       | 小果菘蓝                        | 秋+春              | 中国新疆、中亚、阿富汗、巴基斯坦及伊朗                                                                               | 短角果        | 生理休眠          | Mao & Zhang, 1994; Tang, 2016              |

| 附录I (续) Supplement I (continued) |                      |                                  |                  |                                                                                     |            |               |                                                                                      |
|----------------------------------|----------------------|----------------------------------|------------------|-------------------------------------------------------------------------------------|------------|---------------|--------------------------------------------------------------------------------------|
| 科名                               | 属名                   | 种名                               | 萌发时间             | 分布地                                                                                 | 果实类型       | 休眠类型          | 参考文献                                                                                 |
| Family                           | Genus                | Species                          | Germination time | Distribution                                                                        | Fruit type | Dormancy type | References                                                                           |
|                                  |                      | <i>Isatis minima</i>             | A+S              | Xinjiang of China, Central Asia, Afghanistan, Pakistan and Iran                     | Silicle    | PD            |                                                                                      |
|                                  | 四齿芥属                 | 四齿芥                              | 秋+春              | 中国新疆、俄罗斯、巴基斯坦、阿富汗、伊朗、欧洲东南部等                                                         | 长角果        | 物理+生理休眠       | Mao & Zhang, 1994; Fan <i>et al.</i> , 2010                                          |
|                                  | <i>Tetracme</i>      | <i>Tetracme quadricornis</i>     | A+S              | Xinjiang of China, Russia, Pakistan, Afghanistan, Iran, Southeast Europe, etc.      | Silique    | PY+PD         |                                                                                      |
|                                  |                      | 弯角四齿芥                            | 秋+春              | 中国新疆、伊朗等                                                                            | 长角果        | 不休眠           | Zeng, 2011                                                                           |
|                                  |                      | <i>Tetracme recurvata</i>        | A+S              | Xinjiang of China, Iran, etc                                                        | Silique    | ND            |                                                                                      |
|                                  | 二行芥属                 | 芝麻菜二行芥                           | 秋+春              | 西班牙、法国、意大利、以色列、瑞士等                                                                  | 长角果        | 不休眠           | Perez-Garcia, 1995                                                                   |
|                                  | <i>Diplotaxis</i>    | <i>Diplotaxis eruroides</i>      | A+S              | Spain, France, Italy, Israel, Switzerland, etc.                                     | Silique    | ND            |                                                                                      |
|                                  | 葶苈属                  | <i>Draba cuneifolia</i> *        | 秋+冬              | 美国西部、墨西哥北部                                                                          | 短角果        | 生理休眠          | Liu <i>et al.</i> , 2020                                                             |
|                                  | <i>Draba</i>         |                                  | A+W              | Western America, northern Mexico                                                    | Silicle    | PD            |                                                                                      |
|                                  | 芥属                   | <i>Capsella</i>                  | 秋+春              | 起源于欧亚大陆、非洲, 世界范围内分布                                                                 | 短角果        | 非深度生理休眠       | Baskin <i>et al.</i> , 2014                                                          |
|                                  | <i>Capsella</i>      | <i>bursa-pastoris</i> *          | A+S              | Originated in Eurasia, Africa, worldwide distribution                               | Silicle    | Nondeep PD    |                                                                                      |
| 毛茛科                              | 角果毛茛属                | 角果毛茛                             | 秋+春              | 中国新疆、高加索、西西伯利亚、中亚、伊朗、土耳其及西欧                                                         | 瘦果         | 生理休眠          | Zhang, 1985; Mao & Zhang, 1994; Qiu <i>et al.</i> , 2007; Zhang <i>et al.</i> , 2016 |
| Ranunculaceae                    | <i>Ceratocephala</i> | <i>Ceratocephala testiculata</i> | A+S              | Xinjiang of China, Caucasus, Siberia, Central Asia, Iran, Turkey and western Europe | Achene     | PD            |                                                                                      |
| 蒺藜科                              | 骆驼瓣属                 | 速生霸王                             | 秋+春+夏            | 中国新疆、中亚等                                                                            | 蒴果         | 不休眠           | Mao & Zhang, 1994; Tang, 2016                                                        |
| Zygophyllaceae                   | <i>Zygophyllum</i>   | <i>Zygophyllum lehmannianum</i>  | A+S+SU           | Xinjiang of China, Central Asia, etc.                                               | Capsule    | ND            |                                                                                      |
|                                  | 蒺藜属                  | 蒺藜                               | 秋+春              | 美国、澳大利亚、南非、墨西哥、中国                                                                   | 蒴果         | 生理休眠          | Du <i>et al.</i> , 2022                                                              |
|                                  | <i>Tribulus</i>      | <i>Tribulus terrestris</i>       | A+S              | United States, Australia, South Africa, Mexico, China                               | Capsule    | PD            |                                                                                      |
| 车前科                              | 车前属                  | 小车前                              | 秋+春              | 中国新疆、欧洲南部、高加索、中亚及蒙古                                                                 | 蒴果         | 不休眠           | Mao & Zhang, 1994; Zeng, 2011                                                        |

| 附录I (续) Supplement I (continued) |                   |                              |                  |                                                                                                                                  |            |               |                                                   |
|----------------------------------|-------------------|------------------------------|------------------|----------------------------------------------------------------------------------------------------------------------------------|------------|---------------|---------------------------------------------------|
| 科名                               | 属名                | 种名                           | 萌发时间             | 分布地                                                                                                                              | 果实类型       | 休眠类型          | 参考文献                                              |
| Family                           | Genus             | Species                      | Germination time | Distribution                                                                                                                     | Fruit type | Dormancy type | References                                        |
| Plantaginaceae                   | <i>Plantago</i>   | <i>Plantago minuta</i>       | A+S              | Xinjiang of China, southern Europe, Caucasus, Central Asia and Mongolia                                                          | Capsule    | ND            |                                                   |
|                                  |                   | 圆苞车前                         | 秋+春              | 北美西南部、欧洲南部、北非、中东等                                                                                                                | 蒴果         | 生理休眠          | Clauss <i>et al.</i> , 2000;                      |
|                                  |                   | <i>Plantago ovata</i>        | A+S              | North America, South Europe, North Africa, Middle East, etc.                                                                     | Capsule    | PD            | Liu <i>et al.</i> , 2020                          |
|                                  |                   | <i>Plantago patagonica</i> * | 秋+冬              | 北美洲, 包括加拿大南半部、美国西部和中部、墨西哥北部以及南美洲南部的部分地区                                                                                          | 蒴果         | 生理休眠          | Liu <i>et al.</i> , 2020                          |
|                                  |                   |                              | A+W              | North America, including parts of southern Canada, western and central United States, northern Mexico and southern South America | Capsule    | PD            |                                                   |
|                                  | 离药草属              | 白籽草                          | 春+夏              | 加拿大、美国                                                                                                                           | 蒴果         | 非深度生理休眠       | Baskin <i>et al.</i> , 2014                       |
|                                  | <i>Stemodia</i>   | <i>Leucospora multifida</i>  | S+SU             | Canada, United States                                                                                                            | Capsule    | Nondeep PD    |                                                   |
|                                  | 锦龙花属              | 锦龙花                          | 秋+春              | 美国、加拿大、墨西哥等                                                                                                                      | 蒴果         | 生理休眠          | Bull, 1987                                        |
|                                  | <i>Collinsia</i>  | <i>Collinsia verna</i>       | A+S              | United States, Canada, Mexico, etc.                                                                                              | Capsule    | PD            |                                                   |
|                                  | 婆婆纳属              | 常春藤婆婆纳                       | 秋+春              | 欧洲、中亚                                                                                                                            | 蒴果         | 非深度生理休眠       | Baskin <i>et al.</i> , 2014                       |
|                                  | <i>Veronica</i>   | <i>Veronica hederifolia</i>  | A+S              | Europe, Central Asia                                                                                                             | Capsule    | Nondeep PD    |                                                   |
| 豆科                               | 胡卢巴属              | 弯果胡卢巴                        | 秋+春              | 中国新疆、高加索、西西伯利亚、中亚、伊朗等                                                                                                            | 荚果         | 物理休眠          | Mao & Zhang, 1994; Tang, 2016                     |
| Fabaceae                         | <i>Trigonella</i> | <i>Trigonella arcuata</i>    | A+S              | Xinjiang of China, Caucasus, Siberia, Central Asia, Iran, etc.                                                                   | Legume     | PY            |                                                   |
|                                  |                   | 直果胡卢巴                        | 秋+春              | 中国新疆、高加索、中亚和伊朗                                                                                                                   | 荚果         | 物理休眠          | Mao & Zhang, 1994; Tang, 2016                     |
|                                  |                   | <i>Medicago orthoceras</i>   | A+S              | Xinjiang of China, Caucasus, Central Asia and Iran                                                                               | Legume     | PY            |                                                   |
|                                  |                   | 网脉胡卢巴                        | 秋+春              | 中国新疆、俄罗斯、中亚和西南亚                                                                                                                  | 荚果         | 物理休眠          | Yao <i>et al.</i> , 2005; Du <i>et al.</i> , 2022 |
|                                  |                   | <i>Trigonella cancellata</i> | A+S              | Xinjiang of China, Russia, Central and South-West Asia                                                                           | Legume     | PY            |                                                   |

| 附录I (续) Supplement I (continued) |                          |                                 |                  |                                                                                     |            |               |                                                      |
|----------------------------------|--------------------------|---------------------------------|------------------|-------------------------------------------------------------------------------------|------------|---------------|------------------------------------------------------|
| 科名                               | 属名                       | 种名                              | 萌发时间             | 分布地                                                                                 | 果实类型       | 休眠类型          | 参考文献                                                 |
| Family                           | Genus                    | Species                         | Germination time | Distribution                                                                        | Fruit type | Dormancy type | References                                           |
|                                  | 黄芪属<br><i>Astragalus</i> | 单花胡卢巴                           | 秋+春              | 中亚、东南亚                                                                              | 荚果         | 物理休眠          | Yao <i>et al.</i> , 2005; Du <i>et al.</i> , 2022    |
|                                  |                          | <i>Medicago monantha</i>        | A+S              | Central and South-West Asia                                                         | Legume     | PY            |                                                      |
|                                  |                          | 镰荚黄芪                            | 秋+春              | 中国新疆北部至西部、中亚、阿富汗及东欧                                                                 | 荚果         | 物理休眠          | Mao & Zhang, 1994                                    |
|                                  |                          | <i>Astragalus arpilobus</i>     | A+S              | Northern to Western Xinjiang of China, Central Asia, Afghanistan and Eastern Europe | Legume     | PY            |                                                      |
|                                  |                          | 尖舌黄芪                            | 秋+春              | 中国新疆、中亚、伊朗、巴基斯坦、土耳其、叙利                                                              | 荚果         | 物理休眠          | Mao & Zhang, 1994                                    |
|                                  |                          | <i>Astragalus oxyglottis</i>    | A+S              | 亚等                                                                                  | Legume     | PY            |                                                      |
|                                  |                          |                                 |                  | Xinjiang of China, Central Asia, Iran, Pakistan, Turkey, Syria, etc.                |            |               |                                                      |
|                                  |                          |                                 |                  |                                                                                     |            |               |                                                      |
|                                  |                          |                                 |                  |                                                                                     |            |               |                                                      |
|                                  |                          |                                 |                  |                                                                                     |            |               |                                                      |
| 藜科                               | 猪毛菜属                     | 早熟猪毛菜                           | 秋+春              | 中国新疆北部、俄罗斯                                                                          | 胞果         | 生理休眠          | Zhang, 1985; Tang, 2016                              |
| Chenopodiaceae                   | <i>Kali</i>              | <i>Kali praecox</i>             | A+S              | Northern Xinjiang of China, Russia                                                  | Utricle    | PD            |                                                      |
|                                  |                          | 刺沙蓬                             | 秋+春              | 中国                                                                                  | 胞果         | 生理休眠          | Borger <i>et al.</i> , 2006; Du <i>et al.</i> , 2022 |
|                                  |                          | <i>Kali tragus</i>              | A+S              | China                                                                               | Utricle    | PD            |                                                      |
|                                  | 角果藜属                     | 角果藜                             | 秋+春              | 中国新疆北部、俄罗斯、蒙古、伊朗                                                                    | 胞果         | 生理休眠          | Gao <i>et al.</i> , 2008; Tang, 2006                 |
|                                  | <i>Ceratocarpus</i>      | <i>Ceratocarpus arenarius</i>   | A+S              | Northern Xinjiang of China, Russia, Mongolia, Iran                                  | Utricle    | PD            |                                                      |
|                                  | 滨藜属                      | 犁苞滨藜                            | 秋+春              | 中国新疆、伊朗、阿富汗、俄罗斯、哈萨克斯坦                                                               | 胞果         | 生理休眠          | Tang, 2016                                           |
|                                  | <i>Atriplex</i>          | <i>Atriplex dimorphostegia</i>  | A+S              | Xinjiang of China, Iran, Afghanistan, Russia, Kazakhstan                            | Utricle    | PD            |                                                      |
|                                  | 虫实属                      | 倒披针叶虫实                          | 秋+春+夏            | 中国新疆北部、俄罗斯、阿富汗、伊朗                                                                   | 胞果         | 生理休眠          | Tang, 2016                                           |
|                                  | <i>Corispermum</i>       | <i>Corispermum lehmannianum</i> | A+S+SU           | Northern Xinjiang of China, Russia, Afghanistan, Iran                               | Utricle    | PD            |                                                      |
| 禾本科                              | 旱麦草属                     | 毛穗旱麦草                           | 秋+春              | 中国新疆、中亚                                                                             | 颖果         | 生理休眠          | Lv, 2005; Wang <i>et al.</i> , 2010; Tang, 2016      |
| Poaceae                          | <i>Eremopyrum</i>        | <i>Eremopyrum distans</i>       | A+S              | Xinjiang of China, Central Asia                                                     | Caryopsis  | PD            |                                                      |

| 附录I (续) Supplement I (continued) |               |                             |                  |                                                                       |            |               |                                                      |
|----------------------------------|---------------|-----------------------------|------------------|-----------------------------------------------------------------------|------------|---------------|------------------------------------------------------|
| 科名                               | 属名            | 种名                          | 萌发时间             | 分布地                                                                   | 果实类型       | 休眠类型          | 参考文献                                                 |
| Family                           | Genus         | Species                     | Germination time | Distribution                                                          | Fruit type | Dormancy type | References                                           |
|                                  |               | 光穗旱麦草                       | 秋+春              | 中国新疆北部                                                                | 颖果         | 生理休眠          | Lv, 2005; Du <i>et al.</i> , 2022                    |
|                                  |               | <i>Eremopyrum</i>           | A+S              | Northern Xinjiang of China                                            | Caryopsis  | PD            |                                                      |
|                                  |               | <i>bonaepartis</i>          |                  |                                                                       |            |               |                                                      |
|                                  |               | 东方旱麦草                       | 秋+春              | 内蒙古、新疆                                                                | 颖果         | 生理休眠          | Lv, 2005                                             |
|                                  |               | <i>Eremopyrum orientale</i> | A+S              | Nei Mongol, Xinjiang                                                  | Caryopsis  | PD            |                                                      |
|                                  |               | 旱麦草                         | 秋+春+夏            | 中国新疆、欧洲东部、高加索、西伯利亚及中亚                                                 | 颖果         | 生理休眠          | Lv, 2005; Qiu <i>et al.</i> , 2007                   |
|                                  |               | <i>Eremopyrum triticeum</i> | A+S+SU           | Xinjiang of China, Eastern Europe, Caucasus, Siberia and Central Asia | Caryopsis  | PD            |                                                      |
|                                  | 画眉草属          | 小画眉草                        | 秋+春+夏            | 中国、欧洲、美国、俄罗斯、日本等                                                      | 颖果         | 生理休眠          | Guan <i>et al.</i> , 1998; Qian <i>et al.</i> , 2007 |
|                                  |               | <i>Eragrostis</i>           | A+S+SU           | China, Europe, USA, Russia, Japan, etc.                               | Caryopsis  | PD            |                                                      |
|                                  |               | 齿稃草                         | 秋+春              | 中国(新疆、西藏西部)、地中海地区至印度和巴基斯坦                                             | 颖果         | 生理休眠          | Chen <i>et al.</i> , 2008                            |
|                                  |               | <i>Schismus</i>             | A+S              | China (Xinjiang, western Xizang), Mediterranean to India and Pakistan | Caryopsis  | PD            |                                                      |
|                                  |               | 髯毛齿稃草                       | 秋+夏+冬            | 莫哈韦沙漠的索诺兰和美国西南部(具有入侵性)                                                | 颖果         | 生理休眠          | Adondakis & Venable, 2004; Liu <i>et al.</i> , 2020; |
|                                  |               | <i>Schismus barbatus</i>    | A+SU+W           | Sonolan in Mojave Desert and southwestern United States (invasive)    | Caryopsis  | PD            |                                                      |
|                                  | 雀麦属           | 旱雀麦                         | 秋+春              | 欧洲、亚洲、非洲北部以及北美洲                                                       | 颖果         | 生理休眠          | Beckstead <i>et al.</i> , 1993;                      |
|                                  |               | <i>Bromus</i>               | A+S              | Europe, Asia, North Africa and North America                          | Caryopsis  | PD            |                                                      |
|                                  | 三芒草属          | 三芒草                         | 秋+春              | 世界温带地区                                                                | 颖果         | 不休眠           | Zhang <i>et al.</i> , 2009; Du <i>et al.</i> , 2022  |
|                                  |               | <i>Aristida</i>             | A+S              | Temperate regions of the world                                        | Caryopsis  | ND            |                                                      |
|                                  | 鼠茅属           | 紫鼠茅                         | 秋+春              | 北美、墨西哥、加拿大等                                                           | 颖果         | 生理休眠          | Liu <i>et al.</i> , 2020                             |
|                                  | <i>Vulpia</i> | <i>Vulpia ctoflora</i>      | A+S              | North America, Mexico, Canada, etc.                                   | Caryopsis  | PD            |                                                      |
|                                  | 黍属            | 发枝黍                         | 春+夏              | 北美                                                                    | 颖果         | 非深度生理休眠       | Baskin <i>et al.</i> , 2014                          |

| 附录I (续) Supplement I (continued) |                |                             |                  |                                                         |            |               |                                       |
|----------------------------------|----------------|-----------------------------|------------------|---------------------------------------------------------|------------|---------------|---------------------------------------|
| 科名                               | 属名             | 种名                          | 萌发时间             | 分布地                                                     | 果实类型       | 休眠类型          | 参考文献                                  |
| Family                           | Genus          | Species                     | Germination time | Distribution                                            | Fruit type | Dormancy type | References                            |
| 紫草科<br>Boraginaceae              | <i>Panicum</i> | <i>Panicum capillare</i>    | S+SU             | North America                                           | Caryopsis  | Nondeep PD    |                                       |
|                                  | 鹤虱属            | 狭果鹤虱                        | 秋+春              | 中国(新疆、甘肃、西藏)、欧洲东南部、中亚及阿                                 | 小坚果        | 不休眠           | Zhang,1983; Ma, 2010;                 |
|                                  | <i>Lappula</i> | <i>Lappula semiglabra</i>   | A+S              | 富汗                                                      | Nutlet     | ND            | Zeng, 2011; Tang, 2016                |
|                                  |                |                             |                  | China (Xinjiang, Gansu, Xizang), Southeastern           |            |               |                                       |
|                                  |                |                             |                  | Europe, Central Asia and Afghanistan                    |            |               |                                       |
|                                  |                | 异形狭果鹤虱                      | 秋+春              | 中国、俄罗斯的中亚地区                                             | 小坚果        | 生理休眠          | Zhao, 2007; Du <i>et al.</i> , 2022   |
|                                  |                | <i>Lappula semiglabra</i>   | A+S              | China, Central Asia of Russia                           | Nutlet     | PD            |                                       |
|                                  |                | var. <i>heterocaryoides</i> |                  |                                                         |            |               |                                       |
|                                  |                | 两形果鹤虱                       | 秋+春              | 中国新疆北部, 俄罗斯中亚地区                                         | 小坚果        | 生理休眠          | Ma, 2010                              |
|                                  |                | <i>Lappula duplicicarpa</i> | A+S              | Northern Xinjiang of China, Central Asia of Russia      | Nutlet     | PD            |                                       |
|                                  |                | 石果鹤虱                        | 秋+春              | 亚洲西部、欧洲东部、非洲北部                                          | 小坚果        | 非深度生理休眠       | Malbak, 2015; Tang, 2016              |
|                                  |                | <i>Lappula spinocarpos</i>  | A+S              | Western Asia, Eastern Europe, northern Africa           | Nutlet     | Nondeep PD    |                                       |
|                                  |                | 卵果鹤虱                        | 秋+春              | 中国新疆北部、俄罗斯、中亚、非洲北部、伊朗、                                  | 小坚果        | 生理休眠          | Wang <i>et al.</i> , 2006; Tang, 2016 |
|                                  |                | <i>Lappula patula</i>       | A+S              | 阿富汗、巴基斯坦、印度西北部及克什米尔地区                                   | Nutlet     | PD            |                                       |
|                                  |                |                             |                  | Northern Xinjiang of China, Russia, Central Asia,       |            |               |                                       |
|                                  |                |                             |                  | Northern Africa, Iran, Afghanistan, Pakistan, northwest |            |               |                                       |
|                                  |                |                             |                  | India and Kashmir                                       |            |               |                                       |
|                                  |                | 鹤虱                          | 秋+春              | 中国新疆、欧洲中部和东部、北美洲、阿富汗、巴                                  | 小坚果        | 生理休眠          | Yao <i>et al.</i> , 2002              |
|                                  |                | <i>Lappula myosotis</i>     | A+S              | 基斯坦、俄罗斯                                                 | Nutlet     | PD            |                                       |
|                                  |                |                             |                  | Xinjiang of China, Central and Eastern Europe, North    |            |               |                                       |
|                                  |                |                             |                  | America, Afghanistan, Pakistan, Russia                  |            |               |                                       |
|                                  |                | 短刺鹤虱                        | 秋+春              | 中国新疆、中亚                                                 | 小坚果        | 不休眠           | Forbis, 2010                          |
|                                  |                | <i>Lappula brachycentra</i> | A+S              | Xinjiang of China, Central Asia                         | Nutlet     | ND            |                                       |
|                                  |                | 东北鹤虱                        | 秋+春              | 中国新疆、欧洲东部、伊朗、巴基斯坦、印度西北                                  | 小坚果        | 生理休眠          | Frick, 1984; Wang, 2016               |

| 附录I (续) Supplement I (continued) |                      |                               |                  |                                                                                                             |            |               |                                                |
|----------------------------------|----------------------|-------------------------------|------------------|-------------------------------------------------------------------------------------------------------------|------------|---------------|------------------------------------------------|
| 科名                               | 属名                   | 种名                            | 萌发时间             | 分布地                                                                                                         | 果实类型       | 休眠类型          | 参考文献                                           |
| Family                           | Genus                | Species                       | Germination time | Distribution                                                                                                | Fruit type | Dormancy type | References                                     |
|                                  |                      | <i>Lappula squarrosa</i>      | A+S              | 部、克什米尔地区、中亚<br>Xinjiang of China, Eastern Europe, Iran, Pakistan,<br>northwest India, Kashmir, Central Asia | Nutlet     | PD            |                                                |
|                                  | 翅鹤虱属                 | 翅鹤虱                           | 秋+春              | 中国新疆北部                                                                                                      | 小坚果        | 不休眠           | Zeng, 2011                                     |
|                                  | <i>Lepechiniella</i> | <i>Lappula lasiocarpa</i>     | A+S              | Northern Xinjiang of China                                                                                  | Nutlet     | ND            |                                                |
|                                  | 假狼紫草属                | 假狼紫草                          | 秋+春              | 中国新疆北部、俄罗斯中亚地区、高加索, 伊朗至                                                                                     | 小坚果        | 物理+生理休眠       | Chen <i>et al.</i> , 2008                      |
|                                  | <i>Nonea</i>         | <i>Nonea caspica</i>          | A+S              | 东欧<br>Northern Xinjiang of China, Central Asia, Caucasus,<br>Iran to Eastern Europe                         | Nutlet     | PY+PD         |                                                |
|                                  | 软紫草属                 | 硬萼软紫草                         | 秋+春              | 中国新疆北部、亚洲西部、欧洲、非洲北部                                                                                         | 小坚果        | 物理+形态休眠       | Chen <i>et al.</i> , 2008; Zeng, 2011          |
|                                  | <i>Arnebia</i>       | <i>Arnebia decumbens</i>      | A+S              | Northern Xinjiang of China, Western Asia, Europe,<br>Northern Africa                                        | Nutlet     | PY+MD         |                                                |
|                                  | 琴颈草属                 | <i>Amsinckia menziesii</i>    | 秋+春              | 北美西部、加拿大、墨西哥、南非、澳大利亚                                                                                        | 小坚果        | 生理休眠          | Forbis, 2010                                   |
|                                  | <i>Amsinckia</i>     | var. <i>intermedia</i> *      | A+S              | Western North America, Canada, Mexico, South<br>Africa, Australia                                           | Nutlet     | PD            |                                                |
|                                  |                      | <i>Amsinckia tessellate</i> * | 秋+春              | 北美、墨西哥、加拿大                                                                                                  | 小坚果        | 生理休眠          | Forbis, 2010                                   |
|                                  |                      |                               | A+S              | North America, Mexico, Canada                                                                               | Nutlet     | PD            |                                                |
|                                  | <i>Pectocarya</i> *  | <i>Pectocarya recurvata</i> * | 秋+春+冬            | 内华达州、加利福尼亚南部至墨西哥                                                                                            | 小坚果        | 生理休眠          | Clauss <i>et al.</i> , 2000; Adondakis &       |
|                                  |                      |                               | A+S+W            | Nevada, southern California to Mexico                                                                       | Nutlet     | PD            | Venable, 2004; Liu <i>et al.</i> , 2020;       |
|                                  |                      | <i>Pectocarya</i>             | 秋+冬              |                                                                                                             | 小坚果        | 生理休眠          | Adondakis & Venable, 2004; Liu <i>et al.</i> , |
|                                  |                      | <i>heterocarpa</i> *          | A+W              |                                                                                                             | Nutlet     | PD            | 2020;                                          |
| 菊科                               | 异喙菊属                 | 异喙菊                           | 秋+春              | 中国新疆、俄罗斯(欧洲部分)、高加索、哈萨克斯                                                                                     | 瘦果         | 生理休眠          | Qiu <i>et al.</i> , 2007; Dong, 2021           |
| Asteraceae                       | <i>Heteracia</i>     | <i>Heteracia szovitsii</i>    | A+S              | 坦、乌兹别克斯坦、西亚及伊朗<br>Xinjiang of China, Russia (European part), Caucasus,                                      | Achene     | PD            |                                                |

| 附录I (续) Supplement I (continued) |                    |                             |                  |                                                                                                                                |            |               |                                       |
|----------------------------------|--------------------|-----------------------------|------------------|--------------------------------------------------------------------------------------------------------------------------------|------------|---------------|---------------------------------------|
| 科名                               | 属名                 | 种名                          | 萌发时间             | 分布地                                                                                                                            | 果实类型       | 休眠类型          | 参考文献                                  |
| Family                           | Genus              | Species                     | Germination time | Distribution                                                                                                                   | Fruit type | Dormancy type | References                            |
|                                  |                    |                             |                  | Kazakhstan, Uzbekistan, West Asia and Iran                                                                                     |            |               |                                       |
|                                  | 蓝刺头属               | 砂蓝刺头                        | 秋+春              | 中国、俄罗斯西伯利亚及蒙古                                                                                                                  | 瘦果         | 非深度生理休眠       | Nur <i>et al.</i> , 2014; Nur, 2014   |
|                                  | <i>Echinops</i>    | <i>Echinops gmelinii</i>    | A+S              | China, Russia, Siberia and Mongolia                                                                                            | Achene     | Nondeep PD    |                                       |
|                                  | 小疮菊属               | 小疮菊                         | 秋+春              | 中国新疆、伊朗、高加索                                                                                                                    | 瘦果         | 生理休眠          | Wang <i>et al.</i> , 1993; Tang, 2016 |
|                                  | <i>Garhadiolus</i> | <i>Garhadiolus papposus</i> | A+S              | Xinjiang of China, Iran, Caucasus                                                                                              | Achene     | PD            |                                       |
|                                  | 鼠毛菊属               | 顶毛鼠毛菊                       | 秋+春              | 中国新疆、哈萨克斯坦、乌兹别克斯坦、伊朗、阿                                                                                                         | 瘦果         | 非深度生理休眠       | Nur <i>et al.</i> , 2014; Nur, 2014   |
|                                  | <i>Epilasia</i>    | <i>Epilasia acrolasia</i>   | A+S              | 富汗地区                                                                                                                           | Achene     | Nondeep PD    |                                       |
|                                  |                    |                             |                  | Xinjiang of China, Kazakhstan, Uzbekistan, Iran, Afghanistan                                                                   |            |               |                                       |
|                                  | 蝎尾菊属               | 蝎尾菊                         | 秋+春              | 中国新疆、西亚、俄罗斯、哈萨克斯坦、乌兹别克                                                                                                         | 瘦果         | 非深度生理休眠       | Qiu <i>et al.</i> , 2007; Nur, 2014   |
|                                  | <i>Koelpinia</i>   | <i>Koelpinia linearis</i>   | A+S              | 斯坦、北非                                                                                                                          | Achene     | Nondeep PD    |                                       |
|                                  |                    |                             |                  | Xinjiang of China, Western Asia, Russia, Kazakhstan, Uzbekistan, North Africa                                                  |            |               |                                       |
|                                  | 莴苣属                | 飘带果                         | 秋+春              | 中国新疆、东地中海地区、阿富汗、伊朗、约旦、                                                                                                         | 瘦果         | 不休眠           | Zhang & Tan, 2007                     |
|                                  | <i>Lactuca</i>     | <i>Lactuca undulata</i>     | A+S              | 俄罗斯(西伯利亚)及高加索、哈萨克斯坦、乌兹别克斯坦                                                                                                     | Achene     | ND            |                                       |
|                                  |                    |                             |                  | Xinjiang of China, Eastern Mediterranean, Afghanistan, Iran, Jordan, Russia (Siberia) and the Caucasus, Kazakhstan, Uzbekistan |            |               |                                       |
|                                  |                    | 野莴苣                         | 秋+春              | 俄罗斯(欧洲部分、西伯利亚)以及高加索、东地中                                                                                                        | 瘦果         | 不休眠           | Chadha & Florentine, 2021             |
|                                  |                    | <i>Lactuca serriola</i>     | A+S              | 海地区、哈萨克斯坦、乌兹别克斯坦、伊朗                                                                                                            | Achene     | ND            |                                       |
|                                  |                    |                             |                  | Russia (European, Siberia) and Caucasus, Eastern Mediterranean, Kazakhstan, Uzbekistan, Iran                                   |            |               |                                       |
|                                  | 琉苞菊属               | 琉苞菊                         | 秋+春              | 中国新疆、俄罗斯中亚地区、伊朗                                                                                                                | 瘦果         | 生理休眠          | Qiu <i>et al.</i> , 2007              |

| 附录I (续) Supplement I (continued) |                     |                             |                  |                                                                                                        |            |               |                                                        |
|----------------------------------|---------------------|-----------------------------|------------------|--------------------------------------------------------------------------------------------------------|------------|---------------|--------------------------------------------------------|
| 科名                               | 属名                  | 种名                          | 萌发时间             | 分布地                                                                                                    | 果实类型       | 休眠类型          | 参考文献                                                   |
| Family                           | Genus               | Species                     | Germination time | Distribution                                                                                           | Fruit type | Dormancy type | References                                             |
|                                  | <i>Hyalea</i>       | <i>Centaurea pulchella</i>  | A+S              | Xinjiang of China, Russia, Central Asia, Iran                                                          | Achene     | PD            |                                                        |
|                                  | 珀菊属                 | 黄花珀菊                        | 秋+春              | 中国新疆、欧洲东部、俄罗斯(高加索、西伯利亚                                                                                 | 瘦果         | 生理休眠          | Liu & Liu, 1996                                        |
|                                  | <i>Amberboa</i>     | <i>Amberboa turanica</i>    | A+S              | 及中亚)                                                                                                   | Achene     | PD            |                                                        |
|                                  |                     |                             |                  | Xinjiang of China, Eastern Europe, Russia (Caucasus, Siberia and Central Asia)                         |            |               |                                                        |
|                                  | 异子菊属                | <i>Heterosperma</i>         | 春+夏              | 美国西南部、墨西哥、哥伦比亚                                                                                         | 瘦果         | 生理休眠          | González-Astorga, 2000                                 |
|                                  | <i>Heterosperma</i> | <i>pinnatum</i> *           | S+SU             | Southwest United States, Mexico, Colombia                                                              | Achene     | PD            |                                                        |
|                                  | 万寿菊属                | 小万寿菊                        | 春+夏              | 北美、墨西哥                                                                                                 | 瘦果         | 生理休眠          | González-Astorga, 2000                                 |
|                                  | <i>Tagetes</i>      | <i>Tagetes micrantha</i>    | S+SU             | North America, Mexico                                                                                  | Achene     | PD            |                                                        |
|                                  | 辐枝菊属                |                             | 秋+春              | 非洲、欧洲                                                                                                  | 瘦果         | 生理休眠          | González-Astorga, 2000                                 |
|                                  | <i>Anacyclus</i>    | <i>Anacyclus clavatus</i> * | A+S              | Africa, Europe                                                                                         | Achene     | PD            |                                                        |
|                                  | 蒿属                  | 猪毛蒿                         | 秋+春              | 中国、朝鲜、日本、伊朗、土耳其、阿富汗、巴基                                                                                 | 瘦果         | 生理休眠          | Su, 2019                                               |
|                                  | <i>Artemisia</i>    | <i>Artemisia scoparia</i>   | A+S              | 斯坦、印度、俄罗斯及欧洲东部和中部各国                                                                                    | Achene     | PD            |                                                        |
|                                  |                     |                             |                  | China, Korea, Japan, Iran, Turkey, Afghanistan, Pakistan, India, Russia and Eastern and Central Europe |            |               |                                                        |
|                                  |                     | 黄花蒿                         | 春+夏              | 欧洲、亚洲                                                                                                  | 瘦果         | 不休眠           | Guan <i>et al.</i> , 1998; Baskin <i>et al.</i> , 2014 |
|                                  |                     | <i>Artemisia annua</i>      | S+SU             | Europe, Asia                                                                                           | Achene     | ND            |                                                        |
|                                  | 飞蓬属                 | 小蓬草                         | 秋+春              | 北美、中国、欧洲                                                                                               | 瘦果         | 非深度生理休眠       | Nur, 2014                                              |
|                                  | <i>Erigeron</i>     | <i>Erigeron canadensis</i>  | A+S              | North America, China, Europe                                                                           | Achene     | Nondeep PD    |                                                        |
|                                  | 千里光属                | 疏齿千里光                       | 秋+春              | 中国新疆、外高加索、西伯利亚、中亚地区和蒙古                                                                                 | 瘦果         | 非深度生理休眠       | Du <i>et al.</i> , 2022                                |
|                                  | <i>Senecio</i>      | (近全缘千里光)                    | A+S              | Xinjiang of China, the Caucasus, Siberia, Central Asia                                                 | Achene     | Nondeep PD    |                                                        |
|                                  |                     | <i>Senecio subdentatus</i>  |                  | and Mongolia                                                                                           |            |               |                                                        |
|                                  | <i>Evax</i> *       | <i>Evax multicaulis</i> *   | 冬+春              | 北美、墨西哥                                                                                                 | 瘦果         | 生理休眠          | Adondakis & Venable, 2004; Liu <i>et al.</i> ,         |
|                                  |                     |                             | W+S              | North America, Mexico                                                                                  | Achene     | PD            | 2020                                                   |

| 附录I (续) Supplement I (continued) |                      |                              |                  |                                                   |            |               |                                                      |
|----------------------------------|----------------------|------------------------------|------------------|---------------------------------------------------|------------|---------------|------------------------------------------------------|
| 科名                               | 属名                   | 种名                           | 萌发时间             | 分布地                                               | 果实类型       | 休眠类型          | 参考文献                                                 |
| Family                           | Genus                | Species                      | Germination time | Distribution                                      | Fruit type | Dormancy type | References                                           |
| 罂粟科<br>Papaveraceae              | 绵叶菊属                 | <i>Eriophyllum lanosum</i> * | 夏+冬+春            | 美国西南部和墨西哥西北部                                      | 瘦果         | 生理休眠          | Adondakis & Venable, 2004; Liu <i>et al.</i> ,       |
|                                  | <i>Eriophyllum</i>   |                              | SU+W+S           | Southwest America and northwest Mexico            | Achene     | PD            | 2020                                                 |
|                                  | 筑巢草属                 | <i>Stylocline</i>            | 夏+冬              | 美国、墨西哥                                            | 瘦果         | 生理休眠          | Adondakis & Venable, 2004; Liu <i>et al.</i> ,       |
|                                  | <i>Stylocline</i>    | <i>micropoides</i> *         | SU+W             | United States, Mexico                             | Achene     | PD            | 2020                                                 |
|                                  | 牛膝菊属                 | 牛膝菊(泛指)                      | 春+夏              | 南美、中国                                             | 瘦果         | 非深度生理休眠       | Baskin <i>et al.</i> , 2014                          |
|                                  | <i>Galinsoga</i>     | <i>Galinsoga</i> spp.        | S+SU             | South America, China                              | Achene     | Nondeep PD    |                                                      |
|                                  | 角茴香属                 | 小花角茴香                        | 秋+春              | 中国新疆、印度、伊朗、中亚和西西伯利亚                               | 蒴果         | 物理休眠          | Chen <i>et al.</i> , 2008; Yuan <i>et al.</i> , 2015 |
|                                  | <i>Hypecoum</i>      | <i>Hypecoum</i>              | A+S              | Xinjiang of China, India, Iran, Central Asia and  | Capsule    | PY            |                                                      |
|                                  |                      | <i>parviflorum</i>           |                  | Western Siberia                                   |            |               |                                                      |
|                                  |                      | 角茴香                          | 秋+春              | 中国、蒙古和俄罗斯西伯利亚                                     | 蒴果         | 生理休眠          | Wang <i>et al.</i> , 2006                            |
| 唇形科<br>Lamiaceae                 |                      | <i>Hypecoum erectum</i>      | A+S              | China, Mongolia and Siberia, Russia               | Capsule    | PD            |                                                      |
|                                  | 罂粟属                  | 长莢罂粟                         | 秋+春              | 欧洲                                                | 蒴果         | 非深度形态生理       | Baskin <i>et al.</i> , 2014                          |
|                                  | <i>Papaver</i>       | <i>Papaver dubium</i>        | A+S              | Europe                                            | Capsule    | 休眠            |                                                      |
|                                  |                      |                              |                  |                                                   |            | Nondeep MPD   |                                                      |
|                                  |                      | 虞美人                          | 秋+春              | 欧洲、中国                                             | 蒴果         | 非深度形态生理       | Baskin <i>et al.</i> , 2014                          |
|                                  |                      | <i>Papaver rhoeas</i>        | A+S              | Europe, China                                     | Capsule    | 休眠            |                                                      |
|                                  |                      |                              |                  |                                                   |            | Nondeep MPD   |                                                      |
|                                  | 荆芥属                  | 小花荆芥                         | 秋+春+夏            | 中国新疆、俄罗斯                                          | 小坚果        | 生理休眠          | Chen <i>et al.</i> , 2008; Tang, 2016                |
|                                  | <i>Nepeta</i>        | <i>Nepeta micrantha</i>      | A+S+SU           | Xinjiang of China, Russia                         | Nutlet     | PD            |                                                      |
|                                  | 矮刺苏属                 | 矮刺苏                          | 秋+春              | 中国新疆北部、伊朗、阿富汗及俄罗斯                                 | 小坚果        | 生理休眠          | Sun <i>et al.</i> , 2007; Fu <i>et al.</i> , 2013;   |
| 野芝麻属<br><i>Lamium</i>            | <i>Chamaesphacos</i> | <i>Chamaesphacos</i>         | A+S              | Northern Xinjiang of China, Iran, Afghanistan and | Nutlet     | PD            | Tang, 2016                                           |
|                                  |                      | <i>ilicifolius</i>           |                  | Russia                                            |            |               |                                                      |
|                                  | 野芝麻属                 | 宝盖草                          | 秋+春              | 欧洲、亚洲                                             | 小坚果        | 非深度生理休眠       | Baskin <i>et al.</i> , 2014                          |
|                                  | <i>Lamium</i>        | <i>Lamium amplexicaule</i>   | A+S              | Europe, Asia                                      | Nutlet     | Nondeep PD    |                                                      |
|                                  |                      |                              |                  |                                                   |            |               |                                                      |

| 附录I (续) Supplement I (continued) |                    |                               |                  |                                                                                    |            |               |                                                        |
|----------------------------------|--------------------|-------------------------------|------------------|------------------------------------------------------------------------------------|------------|---------------|--------------------------------------------------------|
| 科名                               | 属名                 | 种名                            | 萌发时间             | 分布地                                                                                | 果实类型       | 休眠类型          | 参考文献                                                   |
| Family                           | Genus              | Species                       | Germination time | Distribution                                                                       | Fruit type | Dormancy type | References                                             |
| 牻牛儿苗科                            | 牻牛儿苗属              | 尖喙牻牛儿苗                        | 秋+春+夏            | 中国新疆、中亚各国、哈萨克斯坦、高加索和西亚                                                             | 蒴果         | 物理休眠          | Wang <i>et al.</i> , 2006                              |
| Geraniaceae                      | <i>Erodium</i>     | <i>Erodium oxyrhinchum</i>    | A+S+SU           | Xinjiang of China, Central Asian States, Kazakhstan, the Caucasus and Western Asia | Capsule    | PY            |                                                        |
|                                  |                    | 喙萼牻牛儿苗                        | 秋+春+夏            | 西班牙、以色列、法国、摩洛哥、意大利等                                                                | 蒴果         | 物理休眠          | Gomaa, 2020                                            |
|                                  |                    | <i>Erodium laciniatum</i>     | A+S+SU           | Spain, Israel, France, Morocco, Italy, etc.                                        | Capsule    | PY            |                                                        |
|                                  |                    | 德州牻牛儿苗                        | 秋+春              | 美国、墨西哥、西班牙                                                                         | 蒴果         | 物理+生理休眠       | Liu <i>et al.</i> , 2020                               |
|                                  |                    | <i>Erodium texanum</i>        | A+S              | United States, Mexico, Spain                                                       | Capsule    | PY+PD         |                                                        |
|                                  |                    | 芹叶牻牛儿苗                        | 秋+春+夏            | 中国、印度西北部、欧洲和北非                                                                     | 蒴果         | 物理+生理休眠       | Liu <i>et al.</i> , 2020                               |
|                                  |                    | <i>Erodium cicutarium</i>     | A+S+SU           | China, northwest India, Europe and North Africa                                    | Capsule    | PY+PD         |                                                        |
|                                  |                    | <i>Erodium crassifolium</i> * | 秋+春              | 以色列、埃及、摩洛哥等                                                                        | 蒴果         | 物理休眠          | Guttermann, 1993                                       |
|                                  |                    |                               | A+S              | Israel, Egypt, Morocco, etc.                                                       | Capsule    | PY            |                                                        |
| 伞形科                              | 刺果芹属               | 刺果芹                           | 秋+春              | 中国新疆、中欧、俄罗斯、西亚至克什米尔一带                                                              | 双悬果        | 非深度形态生理       | Nurulla, 2014                                          |
| Apiaceae                         | <i>Turgenia</i>    | <i>Turgenia latifolia</i>     | A+S              | Xinjiang of China, Central Europe, Russia, West Asia to Kashmir                    | Cremocarp  | 休眠            |                                                        |
| 石竹科                              | 拟漆菇属               | 拟漆菇                           | 秋+春              | 欧洲、亚洲和非洲北部                                                                         | 蒴果         | 非深度生理休眠       | Qian <i>et al.</i> , 2007; Baskin <i>et al.</i> , 2014 |
| Caryophyllaceae                  | <i>Spergularia</i> | <i>Spergularia marina</i>     | A+S              | Europe, Asia and North Africa                                                      | Capsule    | Nondeep PD    |                                                        |
|                                  | 繁缕属                | 繁缕                            | 秋+春              | 世界广布                                                                               | 蒴果         | 非深度生理休眠       | Baskin <i>et al.</i> , 2014                            |
|                                  | <i>Stellaria</i>   | <i>Stellaria media</i>        | A+S              | World wide                                                                         | Capsule    | Nondeep PD    |                                                        |
| 大戟科                              | 大戟属                | 土大戟(矮生大戟)                     | 秋+春              | 中国新疆、中亚                                                                            | 蒴果         | 形态生理休眠        | Mao & Zhang, 1994                                      |
| Euphorbiaceae                    | <i>Euphorbia</i>   | <i>Euphorbia</i>              | A+S              | Xinjiang of China, Central Asia                                                    | Capsule    | MPD           |                                                        |
|                                  |                    | <i>turczaninowii</i>          |                  |                                                                                    |            |               |                                                        |
|                                  |                    | 斑地锦                           | 春+夏              | 北美、欧亚大陆                                                                            | 蒴果         | 非深度生理休眠       | Baskin <i>et al.</i> , 2014                            |
|                                  |                    | <i>Euphorbia maculata</i>     | S+SU             | North America, Eurasia                                                             | Capsule    | Nondeep PD    |                                                        |

| 附录I (续) Supplement I (continued) |                    |                              |                  |                                                      |            |               |                                                            |
|----------------------------------|--------------------|------------------------------|------------------|------------------------------------------------------|------------|---------------|------------------------------------------------------------|
| 科名                               | 属名                 | 种名                           | 萌发时间             | 分布地                                                  | 果实类型       | 休眠类型          | 参考文献                                                       |
| Family                           | Genus              | Species                      | Germination time | Distribution                                         | Fruit type | Dormancy type | References                                                 |
| 桔梗科<br>Campanulaceae             | 沙戟属                | 沙戟                           | 秋+春              | 中国新疆、哈萨克斯坦                                           | 蒴果         | 生理休眠          | Zeng, 2011; Fu <i>et al.</i> , 2013                        |
|                                  | <i>Chrozophora</i> | <i>Chrozophora sabulosa</i>  | A+S              | Xinjiang of China, Kazakhstan                        | Capsule    | PD            |                                                            |
|                                  | 风铃草属               | <i>Campanula</i>             | 秋+春+夏            | 美国、加拿大等                                              | 蒴果         | 形态休眠          | Galloway <i>et al.</i> , 2018; Baskin <i>et al.</i> , 2005 |
|                                  | <i>Campanula</i>   | <i>americana</i> *           | A+S+SU           | United States, Canada, etc.                          | Capsule    | MD            |                                                            |
| 莎草科<br>Cyperaceae                | 莎草属                | 具芒鳞砖子苗                       | 春+夏              | 美国、澳大利亚、墨西哥、加拿大等                                     | 小坚果        | 非深度生理休眠       | Baskin <i>et al.</i> , 1978;                               |
|                                  | <i>Cyperus</i>     | <i>Cyperus squarrosus</i>    | S+SU             | United States, Australia, Mexico, Canada, etc.       | Nutlet     | Nondeep PD    | Baskin <i>et al.</i> , 2014                                |
| 苋科<br>Amaranthaceae              | 珍珠柴属               | <i>Caroxylon inermis</i> *   | 冬+春+夏            | 以色列、土耳其、埃及等                                          | 胞果         | 生理休眠          | Guterman, 1993                                             |
|                                  | <i>Caroxylon</i>   |                              | W+S+SU           | Israel, Turkey, Egypt, etc.                          | Utricle    | PD            |                                                            |
|                                  | 藜属                 | 藜                            | 春+夏              | 欧亚大陆                                                 | 胞果         | 非深度生理休眠       | Baskin <i>et al.</i> , 2014                                |
|                                  | <i>Chenopodium</i> | <i>Chenopodium album</i>     | S+SU             | Eurasia                                              | Utricle    | Nondeep PD    |                                                            |
|                                  | 苋属                 | 苋(泛指)                        | 春+夏              | 热带、亚热带及温带区域                                          | 胞果         | 非深度生理休眠       | Baskin <i>et al.</i> , 2014                                |
|                                  | <i>Amaranthus</i>  | <i>Amaranthus</i> spp.       | S+SU             | Tropical, Subtropical and Temperate Regions          | Utricle    | Nondeep PD    |                                                            |
|                                  | 腺毛藜属               | 香藜                           | 秋+春              | 中国新疆北部                                               | 胞果         | 生理休眠          | Du <i>et al.</i> , 2022                                    |
|                                  | <i>Dysphania</i>   | <i>Dysphania botrys</i>      | A+S              | Northern Xinjiang of China                           | Utricle    | PD            |                                                            |
| 虎耳草科<br>Saxifragaceae            | 虎耳草属               | <i>Saxifraga osloensis</i> * | 秋+春              | 瑞典、挪威、德国                                             | 蒴果         | 生理休眠          | Nilsson, 1995;                                             |
|                                  | <i>Saxifraga</i>   |                              | A+S              | Sweden, Norway, Germany                              | Capsule    | PD            | Baskin <i>et al.</i> , 2014                                |
| 蓼科<br>Polygonaceae               | 刺花蓼属               | <i>Chorizanthe rigida</i> *  | 秋+春              | 北美、墨西哥西北部                                            | 瘦果         | 生理休眠          | Clauss <i>et al.</i> , 2000;                               |
|                                  | <i>Chorizanthe</i> |                              | A+S              | North America, northwest Mexico                      | Achene     | PD            |                                                            |
| 报春花科<br>Primulaceae              | 点地梅属               | 大苞点地梅                        | 秋+春              | 中国、北非、欧洲、中亚至西伯利亚                                     | 蒴果         | 生理休眠          | Yan <i>et al.</i> , 2004; Du <i>et al.</i> , 2022          |
|                                  | <i>Androsace</i>   | <i>Androsace maxima</i>      | A+S              | China, North Africa, Europe, Central Asia to Siberia | Capsule    | PD            |                                                            |

| 附录I (续) Supplement I (continued) |                  |                             |                  |                                                      |            |               |                                             |
|----------------------------------|------------------|-----------------------------|------------------|------------------------------------------------------|------------|---------------|---------------------------------------------|
| 科名                               | 属名               | 种名                          | 萌发时间             | 分布地                                                  | 果实类型       | 休眠类型          | 参考文献                                        |
| Family                           | Genus            | Species                     | Germination time | Distribution                                         | Fruit type | Dormancy type | References                                  |
| 田基麻科                             | 菊蝶花属             | <i>Eucrypta micrantha</i> * | 秋+冬              | 原产于美国西南部、加利福尼亚沙漠和墨西哥西北                               | 蒴果         | 生理休眠          | Liu <i>et al.</i> , 2020                    |
| Hydroleaceae                     | <i>Eucrypta</i>  |                             | A+W              | 部                                                    | Capsule    | PD            |                                             |
|                                  |                  |                             |                  | Originated in southwestern United States, California |            |               |                                             |
|                                  |                  |                             |                  | Desert and northwestern Mexico                       |            |               |                                             |
| 花苣科                              | 绵星花属             | <i>Eriastrum diffusum</i> * | 春+冬              | 原产于美国西南部                                             | 蒴果         | 非深度生理休眠       | Adondakis & Venable, 2004; Baskin <i>et</i> |
| Polemoniaceae                    | <i>Eriastrum</i> |                             | S+W              | Originated in southwest United States                | Capsule    | Nondeep PD    | <i>al.</i> , 2014                           |
| 蔷薇科                              | 霓裳草属             | <i>Aphanes arvensis</i> *   | 秋+春              | 密克罗尼西亚联邦、欧洲、亚洲                                       | 瘦果         | 非深度生理休眠       | Baskin <i>et al.</i> , 2014                 |
| Rosaceae                         | <i>Aphanes</i>   |                             | A+S              | Federated States of Micronesia, Europe, Asia         | Achene     | Nondeep PD    |                                             |
| 粟米草科                             | 毯粟草属             | 毯粟草                         | 春+夏              | 中国、热带美洲、欧洲南部和日本                                      | 蒴果         | 非深度生理休眠       | Baskin <i>et al.</i> , 2014                 |
| Molluginaceae                    | <i>Mollugo</i>   | <i>Mollugo verticillata</i> | S+SU             | China, Tropical America, southern Europe and Japan   | Capsule    | Nondeep PD    |                                             |
| 马齿苋科                             | 马齿苋属             | 马齿苋                         | 春+夏              | 世界温带和热带地区                                            | 蒴果         | 非深度生理休眠       | Baskin <i>et al.</i> , 2014                 |
| Portulacaceae                    | <i>Portulaca</i> | <i>Portulaca oleracea</i>   | S+SU             | World temperate and tropical regions                 | Capsule    | Nondeep PD    |                                             |

\*表示目前尚无正式的中文译名。A, 秋季; S, 春季; SU, 夏季; W, 冬季。MD, 形态休眠; MPD, 形态生理休眠; ND, 不休眠; Nondeep PD, 非深度生理休眠; PD, 生理休眠; PD+PY, 生理+物理休眠; PY, 物理休眠; PY+MD, 物理+形态休眠。

\* indicates that there is no official Chinese translation yet. A, autumn; S, spring; SU, summer; W, winter. MD, morphological dormancy; MPD, morphophysiological dormancy; ND, nondormancy; Nondeep PD, Nondeep physiological dormancy; PD, physiological dormancy; PD+PY, physiological and physical dormancy; PY, physical dormancy; PY+MD, physical and morphophysiological dormancy.

参考文献

Adondakis S, Venable DL (2004). Dormancy and germination in a guild of Sonoran Desert annuals. *Ecology*, 85, 2582-2590.

Baskin CC, Baskin JM (2005). Underdeveloped embryos in dwarf seeds and implications for assignment to dormancy class. *Seed Science Research*, 15, 357-360.

Baskin JM, Baskin CC (2014). What kind of seed dormancy might palms have? *Seed Science Research*, 24, 17-22.

Baskin JM, Baskin CC (1978). Seasonal changes in the germination response of *Cyperus inflexus* seeds to temperature and their ecological significance. *Botanical Gazette*, 139, 231-235.

Beckstead J, Meyer SE, Allen PS (1993). Effects of afterripening on cheatgrass (*Bromus tectorum*) and squirreltail (*Elymus elymoides*) germination//Roundy BA, McArthur ED, Haley JS, Mann DK. *Proceedings: Wildland Shrub and Arid Land Restoration Symposium*. Rocky Mountain Research Station, Las Vegas, USA.165-172.

- Bull JJ (1987). Evolution of phenotypic variance. *Evolution*, 41, 303-315.
- Chadha A, Florentine S (2021). Biology, ecology, distribution and control of the invasive weed, *Lactuca serriola* L. (wild lettuce): a global review. *Plants*, 10, 2157. DOI: 10.3390/plants10102157.
- Chen ZC, Shi ZY, Tian CY, Feng G (2008). Diversity and spatial distribution characteristics of ephemeral plants germinated in autumn in the southern edge of Gurbantunggut Desert. *Journal of Anhui Agricultural Sciences*, 36, 2016-2018. [陈志超, 石兆勇, 田长彦, 冯固 (2008). 古尔班通古特沙漠南缘荒漠秋萌短命植物多样性及其空间分布特征. 安徽农业科学, 36, 2016-2018.]
- Clauss MJ, Venable DL (2000). Seed germination in desert annuals: an empirical test of adaptive bet hedging. *The American Naturalist*, 155, 168-186.
- Dong WJ (2021). *Role of Anatomy and Characteristics of Dispersal and Dormancy/Germination of Canopy Seed Bank in a Desert Annual Species Heteracia szovitsii*. Master degree dissertation, Xinjiang Agricultural University, Ürümqi. [董文静 (2021). 荒漠一年生植物异喙菊植冠种子库的结构成因、扩散及休眠与萌发特性. 硕士学位论文, 新疆农业大学, 乌鲁木齐.]
- Du JQ, Liu T, Wang HY, Zhao WX, Wang J, Xu WB (2022). Floristic composition, distribution, and resource types of desert annual plants in Xinjiang. *Arid Zone Research*, 39, 185-209. [杜佳倩, 刘彤, 王寒月, 赵文轩, 王杰, 徐文斌 (2022). 新疆荒漠一年生植物区系组成、分布及资源类型. 干旱区研究, 39, 185-209.]
- Fan CZ, Zhao HX, Gao XW, Li Q (2010). Study on seed germination characteristics and seedling physiological of two ephemera plants. *Seed*, 29, 33-37. [樊丛照, 赵惠新, 高兴旺, 李群 (2010). 两种短命植物种子萌发特性和幼苗生理的研究. 种子, 29, 33-37.]
- Forbis TA (2010). Germination phenology of some Great Basin native annual forb species. *Plant Species Biology*, 25, 221-230.
- Fu CZ, Guo BL (2013). Review on dormancy research of medicinal plant seeds. *Modern Chinese Medicine*, 15, 776-782. [付长珍, 郭宝林 (2013). 药用植物种子休眠研究概述. 中国现代中药, 15, 776-782.]
- Galloway LF, Watson RHB, Prendeville HR (2018). Response to joint selection on germination and flowering phenology depends on the direction of selection. *Ecology and Evolution*, 8, 7688-7696.
- Gao R, Wei Y, Yan C (2008). Amphicarp and seed germination behavior of *Ceratocarpus arenarius* L. (Chenopodiaceae). *Chinese Journal of Ecology*, 27, 23-27. [高蕊, 魏岩, 严成 (2008). 角果藜的地上地下结果性与种子萌发行. 生态学杂志, 27, 23-27.]
- Gomaa NH (2020). Germination time influences post-germination life-history traits and progeny seed germination patterns in the desert annual *Erodium laciniatum* (Geraniaceae). *Botany*, 98, 563-573.
- González-Astorga J, Núñez-Farfán J (2000). Variable demography in relation to germination time in the annual plant *Tagetes micrantha* Cav. (Asteraceae). *Plant Ecology*, 151, 253-259.
- Graeber K, Voegelé A, Buettner-Mainik A, Sperber K, Mummenhoff K, Leubner-Metzger G (2013). Spatiotemporal seed development analysis provides insight into primary dormancy induction and evolution of the *Lepidium DELAY OF GERMINATION1* genes. *Plant Physiology*, 161, 1903-1917.
- Guan KL, Ge HH (1998). Dormancy and photoperiod germination of pastoral weed seeds. *Plant Physiology Communications*, 34, 377-380. [管康林, 葛惠华 (1998). 田园杂草种子的休眠和需光萌发. 植物生理学通讯, 34, 377-380.]
- Lu JJ, Tan DY, Baskin CC, Baskin JM (2017). Role of indehiscent pericarp in formation of soil seed bank in five cold desert Brassicaceae species. *Plant Ecology*, 218, 1187-1200.
- Lu JJ, Tan DY, Baskin CC, Baskin JM (2016). Effects of germination season on life history traits and on transgenerational plasticity in seed dormancy in a cold desert annual. *Scientific Reports*, 6, 25076. DOI: 10.1038/srep25076.
- Lu JJ, Tan DY, Baskin JM, Baskin CC (2014). Germination season and watering regime, but not seed morph, affect life history traits in a cold desert diaspore-heteromorphic annual. *PLoS ONE*, 9, e102018. DOI: 10.1371/journal.pone.0102018.
- Liu SS, Bradford KJ, Huang ZY, Venable DL (2020). Hydrothermal sensitivities of seed populations underlie fluctuations of dormancy states in an annual plant community. *Ecology*, 101, e02958. DOI: 10.1002/ecy.2958.
- Liu XY, Liu S (1996). Analysis of dynamics of plant weight in ephemerals. *Acta Phytocologica Sinica*, 20, 177-183. [刘晓云, 刘速 (1996). 短生植物重量的动态变化及其分析. 植物生态学报, 20, 177-183.]
- Luo C, Liu T, Wei P, Song HL, Zhao FX (2004). A study on phenotypic plasticity of *Arabidopsis pumila* in Xinjiang in different light conditions. *Journal of Shihezi University (Natural Science)*, 22, 149-153. [骆郴, 刘彤, 魏鹏, 宋红丽, 赵峰侠 (2004). 不同光照条件下新疆小拟南芥(*Arabidopsis pumila*)的表型可塑性研究. 石河子大学学报(自然科学版), 22, 149-153.]
- Ma WB (2010). *Fruit Polymorphism and Plasticity in two Species of Lappula*. PhD dissertation, Nanjing Forestry University, Nanjing. [马文宝 (2010). 两种鹤虱属植物果实多态性和表型可塑性研究. 博士学位论文, 南京林业大学, 南京.]
- Malbak M (2015). *Seed Dormancy and Germination of the Short-lived Plant Diptera sarcophagus*. Master degree dissertation, Xinjiang Agricultural University, Ürümqi. [玛伊热·马力巴克 (2015). 短

- 命植物石果鹤虱连种体的种子休眠与萌发. 硕士学位论文, 新疆农业大学, 乌鲁木齐.]
- Mamut J (2011). *Study on the Seed Ecology of the Short-lived Plant Cardoso tomentosa*. Master degree dissertation, Xinjiang Agricultural University, Ürümqi. [吉乃提汗·马木提 (2011). 短命植物绵果芥的种子生态学研究. 硕士学位论文, 新疆农业大学, 乌鲁木齐.]
- Mao ZM, Zhang DM (1994). The conspectus of ephemeral flora in northern Xinjiang. *Arid Zone Research*, 11, 1-26. [毛祖美, 张佃民 (1994). 新疆北部早春短命植物区系纲要. 干旱区研究, 11, 1-26.]
- Nilsson T (1995). Density dependent processes and the importance of periodic germination in the winter annual plant *Saxifraga osloensis*. *Ecography*, 18, 131-137.
- Nur M (2014). *Seed Dormancy and Germination Characteristics of Three Annual Asteraceae Species*. Master degree dissertation, Xinjiang Agricultural University, Ürümqi. [米热拉依·努尔 (2014). 三种菊科一年生植物的种子休眠与萌发特性. 硕士学位论文, 新疆农业大学, 乌鲁木齐.]
- Perez-Garcia F, Iriondo JM, Martinez-Laborde JB (1995). Germination behaviour in seeds of *Diploaxis eruroides* and *D. virgata*. *Weed Research*, 35, 495-502.
- Qian YB, Wu ZN, Zhang LY, Zhao RF, Wang XY, Li YM (2007). Spatial distribution characteristics of ephemeral plants in Gurbantunggut Desert. *Chinese Science Bulletin*, 52, 2299-2306. [钱亦兵, 吴兆宁, 张立运, 赵锐锋, 王小燕, 李有民 (2007). 古尔班通古特沙漠短命植物的空间分布特征. 科学通报, 52, 2299-2306.]
- Qiu J, Tan DY, Fan DY (2007). Characteristics of photosynthesis and biomass allocation of spring ephemerals in the Junggar Desert. *Journal of Plant Ecology (Chinese Version)*, 31, 883-891. [邱娟, 谭敦炎, 樊大勇 (2007). 准噶尔荒漠早春短命植物的光合特性及生物量分配特点. 植物生态学报, 31, 883-891.]
- Su Y (2019). *Characteristics of Population Dynamics of Artemisia scoparia in Desert Steppe*. Master degree dissertation, Ningxia University, Yinchuan. [苏莹 (2019). 荒漠草原不同土壤类型及降水量对猪毛蒿种群特征的影响. 硕士学位论文, 宁夏大学, 银川.]
- Sun HL, Wang SM, Ma JY, Zhang X (2007). Study on stable carbon isotope composition in ephemeral plants in the Junggar Basin. *Arid Zone Research*, 24, 652-656. [孙惠玲, 王绍明, 马剑英, 张霞 (2007). 准噶尔盆地早春短命植物碳同位素组成研究. 干旱区研究, 24, 652-656.]
- Tang LH (2016). *Effect of precipitation Change on Germination Plasticity and Life History of Annual Ephemerals*. Master degree dissertation, Xinjiang Agricultural University, Ürümqi. [汤灵红 (2016). 降水变化对一年生短命植物的萌发可塑性及生活史的影响. 硕士学位论文, 新疆农业大学, 乌鲁木齐.]
- Wang XQ, Jiang J, Wang YC, Luo WL, Song CW, Chen JJ (2006). Response of ephemeral plant growth to changes of hydrothermal conditions in southern Gurbantunggut Desert. *Chinese Science Bulletin*, 51, 88-93. [王雪芹, 蒋进, 王远超, 罗伟林, 宋春武, 陈均杰 (2006). 古尔班通古特沙漠南部短命植物生长对水热条件变化的响应. 科学通报, 51, 88-93.]
- Wang Y (1993). Phenological observation of the early spring ephemeral and ephemeroid plant in Xinjiang. *Arid Zone Research*, 10, 34-39. [王烨 (1993). 新疆早春短命及类短命植物的物候观测. 干旱区研究, 10, 34-39.]
- Wang YQ (2016). *Effect of Precipitation Change on Life History of Annual Plant Distributed Widely in Desert Region of Central Asia*. Master degree dissertation, Xinjiang Agricultural University, Ürümqi. [王永秋 (2016). 降水变化对中亚荒漠一年生植物生活史的影响. 硕士学位论文, 新疆农业大学, 乌鲁木齐.]
- Xu CH (2012). *The Evaluation of Drought Resistance and the Study on Drought Resistant Mechanism of two Ephemeral Plants*. Master degree dissertation, Xinjiang Agricultural University, Ürümqi. [许春华 (2012). 两种短命植物抗旱性评价及其机理研究. 硕士学位论文, 新疆农业大学, 乌鲁木齐.]
- Yao H, Tan DY (2005). Size-dependent reproductive output and life-history strategies in four ephemeral species of *trigonella*. *Acta Phytocologica Sinica*, 29, 954-960. [姚红, 谭敦炎 (2005). 胡卢巴属4种短命植物个体大小依赖的繁殖输出与生活史对策. 植物生态学报, 29, 954-960.]
- Yao H, Tan DY, Qu RM (2002). Fruiting characteristics of 14 early spring ephemeral plants//Abstracts of the 7th Chinese Young Scientist Conference on Systematic and Evolutionary Botany. 113-114. [姚红, 谭敦炎, 曲荣明 (2002). 14种早春短命植物的结实特性//第七届全国系统与进化植物学青年学术研讨会论文摘要集. 113-114.]
- Yan L, Li H, Duan CQ, Li X (2004). The studies on seed characters of 13 species of wild decorative plants. *Journal of Arid Land Resources & Environment*, 18, 151-158. [燕玲, 李红, 段淳清, 李香 (2004). 13种野生观赏植物种子特性的研究. 干旱区资源与环境, 18, 151-158.]
- Yuan SF, Tang HP, Zhang HF (2015). On the relationships between intra-annual variation of ephemeral synusia and hydrothermal conditions. *Arid Zone Research*, 32, 941-946. [袁素芬, 唐海萍, 张宏锋 (2015). 短命植物层群落年内变化与水热条件的关系. 干旱区研究, 32, 941-946.]
- Yuan Z (2020). *Seed Germination Characteristics and Its Response to Maternal Environment of Thlaspi arvense*. Master degree dissertation, Lanzhou University, Lanzhou. [袁祯 (2020). 蒺藜(*Thlaspi arvense*)种子萌发特性及其对母本环境的响应. 硕士学位论文, 兰州大学, 兰州.]
- Zeng XL (2011). *Characters and Trend of Seeds Germinate in Autumn in Grubantonggut Desert, China*. Master degree dissertation, Shihezi University, Shihezi, Xinjiang. [曾晓玲 (2011). 古尔班通古

- 特沙漠种子秋萌特征及萌发趋势的研究. 硕士学位论文, 石河子大学, 新疆石河子.]
- Zhang LY (1985). A preliminary study on the ephemerals in the mosowan district, Xinjiang. *Acta Phytoecologica Bt Geobotanica Sinica*, 9, 213-222. [张立运 (1985). 新疆莫索湾地区短命植物的初步研究. 植物生态学与地植物学丛刊, 9, 213-222.]
- Zhang JE, Liang CZ, Fu XY, Yan JC (2009). Seed germination characteristics and ecological adaption of annual plants in Alasha region. *Journal of Arid Land Resources and Environment*, 23, 175-179. [张继恩, 梁存柱, 付晓玥, 闫建成 (2009). 阿拉善荒漠一年生植物种子萌发特性及生态适应性分析. 干旱区资源与环境, 23, 175-179.]
- Zhang XL, Wu ZZ, Ma M (2016). Study on seed germination of invasive plant bur buttercup (*Ceratocephalus testiculatus*). *Acta Agrestia Sinica*, 24, 849-853. [张旭龙, 吴振振, 马淼 (2016). 入侵植物角果毛茛种子萌发特性的研究. 草地学报, 24, 849-853.]
- Zhao XJ (2007). *Reproductive Characteristics and Fruit Polymorphysm in two Ephemeral Species of Lappula*. Master degree dissertation, Xinjiang Agricultural University, Ürümqi. [赵学杰 (2007). 两种鹤虱属短命植物的繁育特性及果实多态性. 硕士学位论文, 新疆农业大学, 乌鲁木齐.]
- Zhang XT, Tan DY (2007). Phenology of 10 ephemeral species of Asteraceae in relation to the main meteorological factors. *Arid Zone Research*, 24, 470-475. [张学涛, 谭敦炎 (2007). 10种菊科短命植物的物候与主要气象因子的关系. 干旱区研究, 24, 470-475.]
- Zhou YM (2015). *Effect of the Pericarp and Germination Time on Soil Seed Bank and Life History of Isatis violascens (Brassicaceae)*. Master degree dissertation, Xinjiang Agricultural University, Ürümqi. [周园梅 (2015). 宽翅菥蓂果皮与萌发时间对土壤种子库及生活史的影响. 硕士学位论文, 新疆农业大学, 乌鲁木齐.]