

Biological Studies of Insects Feeding on the Kudzu Plant, *Pueraria lobata* (Leguminosae) I. List of Feeding Species

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Introduction

Kudzu, *Pueraria lobata* (Willd.) Ohwi, is a vigorous perennial vine which is widely distributed in the temperate and tropical regions in Asia²⁴). The plant has both useful and harmful phases from an applied point of view. The tuber containing starch can be made into flour for food or utilized for medical purposes, and the leaves are used for fodder. In ancient times, textiles were made from the stalk²⁴). The Chinese crude drug “Gehua”, used as a folk medicine in China, Taiwan, Korea and Japan, is considered to be the flower of *Pueraria* spp.²⁷). Several chemical substances isolated from the callus tissues induced on the stem are also utilized in various medical treatments^{56,60}).

The plant, however, has now run wild, becoming a serious weed on fallow land, riverbanks and roadsides in Japan. The plant, introduced in the United States about a century ago from Japan to prevent soil erosion^{19,49,54}), has been both of benefit and a nuisance and is now out of control there also⁵⁸). Kudzu was used as a food and fuel⁶¹) in addition to its benefits as an erosion protective agent, but now has become a noxious weed that displaced local flora in several areas^{5,6,49}).

Van Emden^{65,66}) aroused interest in wild plants for crop pest management, and the Kudzu plant may play an important role in this since it is widely distributed around agroecosystems.

Despite its important status, the Kudzu plant has not been studied for its associated insects, nor for a means of biological control¹⁷) which has not been succeeded owing to its large tuber roots though chemical control of the plant has been tried also in both countries mentioned³⁷). It was thus believed valuable to conduct fundamental studies on the insects associated with the plant for the purposes mentioned above.

Following a preliminary survey on insects of the plant made in Yamaguchi City in 1984¹⁸), the first author began biological studies of its dominant phytophagous bugs in the same area in 1986 and 1987 and reported the biological data of two species^{62,63}).

The present study was carried on in Kagoshima City to accumulate further biological data on Kudzu-feeding species for future application. Among feeders found in the Kagoshima area, 18 insect species and 1 mite species were selected, and their seasonal abundance and habitat or within-plant distribution were studied.

The insect species belong to the following 4 orders: Hemiptera (5 species), Coleoptera (5

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species), Diptera (3 species) and Lepidoptera (5 species). Among those, four leaf-miner species, i.e.,—*Japanagromyza tristella*, *Liocrobyla lobata*, *Neolithocolletis hikomonticola* and *Spulerina dissotoma*—were intensively studied for their biology and distribution within the leaf since they are expected candidates as biological control agents.

Three other species—*Homoeocerus unipunctatus*, *Hedylepta misera* and *Matsumuraeses falcana*—were studied for their development since they were found to be dominant in the survey area and to attack other leguminous plants.

This study was thus designed to elucidate the following: (1) species composition of Kudzu-feeding insects, (2) seasonal abundance and habitat on the plant of the selected species, (3) biology and distribution within the leaf of the four leafminers, (4) biological data including developmental period, developmental zero, total effective temperature, adult longevity and fertility of the three dominant species.

In this paper, species composition of Kudzu-feeding species is enumerated, and remaining topics together with the methods and materials used will be reported in a second paper as well as general remarks about the overall studies.

Materials and Methods

Sampling procedures

Samplings of phytophagous insects were conducted during 1988–1989 at three Kudzu growing sites in Kagoshima City: Korimoto graveyard, Shimota and Toso. When immature and mature insects were discovered, they were hand-picked or aspirated from Kudzu plants on the field at one week intervals, with 1 or 2 hours usually spent at each site. The affected plant parts were collected together with the suspected feeding insects, placed in plastic bags and brought back to the laboratory for rearings. Insects resting on the plants and pollinators were not included in this study.

Another field investigation was conducted at two sites, Korimoto graveyard and Toso, from early May to early December in 1988 and from late March to early December in 1989 to monitor seasonal abundance of the feeding species. Data on the feeding species composition obtained in this investigation are also referred to here, though the method used together with that for samplings to determine seasonal abundance, rearing and development will be described in Part 2.

Results and Discussion

1. List of feeding species

A total of 71 species of Insecta and 2 species of Arachnoidea have been previously recorded from the Kudzu plant, *Pueraria lobata* (Willd.) Ohwi from Japan and USA so far as we are aware. In the present study, a total of 61 species of Insecta and one species of Arachnoidea feeding on Kudzu plants, including newly found species were observed in Kagoshima City. Among them, a total of 38 species belonging to 26 families of 5 insect orders are recorded for the first time from this plant.

Those known and the newly found species, a total of 109 species belonging to 46 families of 6 insect orders and 2 species of Acarina, are listed and shown in Table 1 and Fig. 1.

The number of species in each order is as follows: Orthoptera (5%)—6 species of 4 families, Hemiptera (Homoptera) (10%)—11 species of 10 families, Hemiptera (Heteroptera) (23%)—26

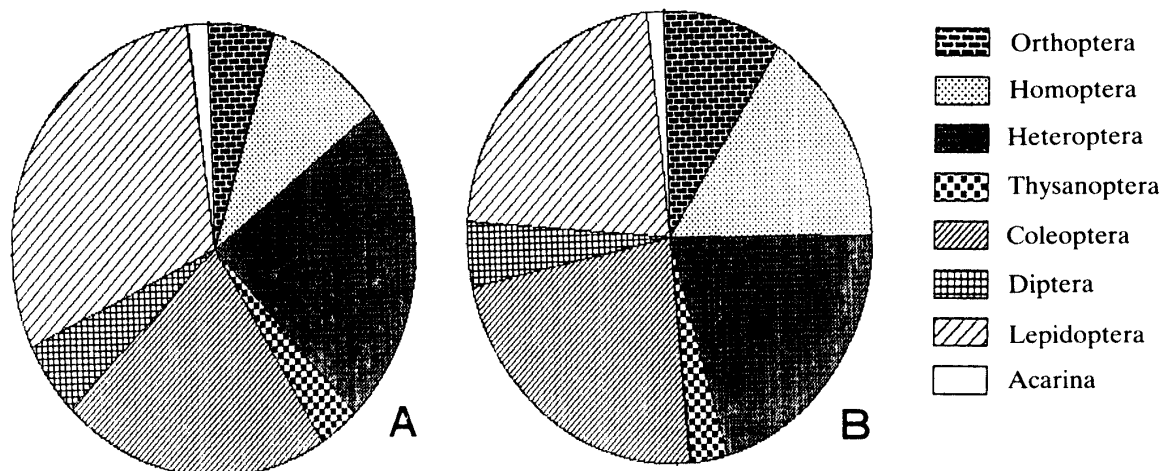


Fig. 1. Percentage of phytophagous species of Kudzu plant belonging to different orders, A: Known feeding species based on published records and those found in Kagoshima City, B: Feeding species found in Kagoshima City.

species of 8 families, Thysanoptera (4%)—4 species of 1 family, Coleoptera (22%)—24 species of 8 families, Diptera (5%)—6 species of 2 families, Lepidoptera (29%)—32 species of 13 families, Acarina (2%)—2 species of 1 family. Hemiptera, Coleoptera and Lepidoptera are dominant among the order recorded.

Most of the species listed in Table 1 are polyphagous and attack other plants such as soybean, *Glycine max* Merr., adzuki bean, *Vigna angularis* (Willd.) Ohwi et Ohashi var. *angularis*, wisteria, *Wisteria brachybotrys* Sieb. et Zucc., and other leguminous plants. Of the 62 species found in Kagoshima City, 38 are foliage-feeding including gall-makers and leafminers, 23 are sap-feeding and only 1 species is endophagous on stored seed. Nineteen species of which biology is described in Part 2 are comparatively dominant. Only 14 among the Kudzu-feeding species listed below are monophagous on Kudzu plant so far as we know.

Hemiptera

Miridae: *Proboscidocoris varicornis* (Jakovlev)

Thysanoptera

Thripidae: *Salpingothrips aimatofus* Kudo

Coleoptera

Buprestidae: *Trachys auricollis* E. Saunders

Curculionidae: *Mesalcidodes trifidus* (Pascoe)

Diptera

Cecidomyiidae: *Lasioptera puerariae* Shinji; *Pitydiplosis* sp.; Genus sp.

Agromyzidae: *Ophiomyia puerarivora* Sasakawa

Lepidoptera

Lyonetiidae: *Leucoptera puerariella* Kuroko

Gracillariidae: *Liocrobyla lobata* Kuroko; *Neolithocolletis hikomonticola* Kumata

Pyralidae: *Hedylepta misera* (Butler); *Pleuroptya punctimarginalis* (Hampson)

Noctuidae: *Microxyyla confusa* (Wileman)

2. Newly recorded species from Kudzu plant

A total of 38 species belonging to 26 families of 5 insect orders were among those collected and are recorded here for the first time from Kudzu plant; data on collection follows. The words—Korimoto, Shimota and Toso—identify the locality in Kagoshima City where collection was made, and all specimens were collected by the first author (JT).

Insecta

Orthoptera

Tettigoniidae

Gampsocleis buergeri (de Haan)

Specimen examined. Toso: 1 ex., 9. v. 1988.

Pyrgomorphidae

Atractomorpha lata (Motschulsky)

Specimens examined. Korimoto: 1 ex., 5. ix. 1988. Shimota: 1 ex., 8. ix. 1988; 1 ex., 22. ix. 1988. Toso: 1 ex., 2. ix. 1988; 1 ex., 9. ix. 1988; 2 ex., 22. ix. 1988.

Acrididae

Acrida cinerea (Thunberg)

Specimen examined. Korimoto: 1 ex., 5. viii. 1988.

Oxya japonica japonica (Thunberg)

Specimen examined. Toso: 1 ex., 22. ix. 1988.

Patanga japonica (Bolivar)

Specimens examined. Korimoto: 1 ex., 11. vi. 1988; 1 ex., 4. vii. 1988. Toso: 1 ex., 4. vi. 1988; 1 ex., 17. vi. 1988.

Tetrigidae

Tetrix japonica (Bolivar)

Specimen examined. Toso: 1 ex., 9. v. 1988.

Hemiptera

Flatidae

Geisha distinctissima (Walker)

Specimens examined. Korimoto: 3 ex., 13. vi. 1988. Toso: 1 ex., 24. vi. 1988. Shimota: 2 ex., 27. vi. 1988.

Ricaniidae

Orosanga japonica (Melichar)

Specimens examined. Korimoto: 5 ex., 27. vi. 1988. Shimota: 3 ex., 1. vi. 1988. Toso: 2 ex., 19. viii. 1988.

Cercopidae

Eoscartopis assimilis (Uhler)

Specimens examined. Korimoto: 1 ex., 20. v. 1988. Shimota: 2 ex., 15. vi. 1988

Penthimiidae

Penthimia nitida Lethierry

Specimen examined. Shimota: 1 ex., 24. viii. 1988.

Cicadellidae

Bothrogonia ferruginea (Fabricius)

Specimens examined. Shimota: 2 ex., 15. vi. 1988.

Cicadella viridis (L.)

Specimens examined. Korimoto: 2 exx., 22. viii. 1988. Shimota: 3 exx., 24. viii. 1988.

Typhlocybidae

Empoasca sp.

Specimens examined. Shimota: 3 exx., 1. vi. 1988.

Miridae

Adelphocoris triannulatus (Stål)

Specimens examined. Shimota: 1 ex., 8. ix. 1988. Toso: 1 ex., 1. v. 1988.

Berytidae

Metacanthus pulchellus Dallas

Specimens examined. Shimota: 1 ex., 19. x. 1988. Toso: 1 ex., 11. vi. 1988; 2 exx., 24. vi. 1988; 1 ex., 28. x. 1988.

Lygaeidae

Nysius plebejus Distant

Specimens examined. Shimota: 1 ex., 15. iv. 1988; 1 ex., 8. ix. 1988; 2 exx., 22. ix. 1988; 2 exx., 5. x. 1988; 1 ex., 19. x. 1988. Toso: 1 ex., 11. vi. 1988.

Alydidae

Riptortus clavatus (Thunberg)

Specimens examined. Shimota: 3 exx., 8. ix. 1988; 1 ex., 22. ix. 1988.

Coreidae

Stictopleurus punctatonevosus Goeze

Specimens examined. Toso: 1 ex., 27. v. 1988. Shimota: 1 ex., 15. vi. 1988.

Cletus trigonus (Thunberg)

Specimen examined. Shimota: 1 ex., 1. vi. 1988.

Pentatomidae

Eysarcoris ventralis (Westwood)

Specimens examined. Toso: 1 ex., 11. vi. 1988; 1 ex., 9. ix. 1988; 1 ex., 21. x. 1988.

Thysanoptera

Thripidae

Thrips hawaiiensis (Morgan)

Specimens examined. Korimoto: 213 exx., 3. x. 1988.

Megaleurothrips distalis (Karny)

Specimens examined. Korimoto: 12 exx., 3. x. 1988.

Coleoptera

Scarabaeidae

Anomala lucens Ballion

Specimens examined. Korimoto: 2 exx., 13. vi. 1988; 2 exx., 20. vi. 1988; 3 exx., 27. vi. 1988; 2 exx., 11. vii. 1988; 1 ex., 25. vii. 1988; 1 ex., 8. viii. 1988; 2 exx., 15. vii. 1988; 2 exx., 22. viii. 1988; 1 ex., 29. viii. 1988; 1 ex., 5. ix. 1988. Shimota: 3 exx., 8. ix. 1988; 1 ex., 10. viii. 1988; 1 ex., 24. viii. 1988. Toso: 2 exx., 19. viii. 1988; 2 exx., 26. viii. 1988; 1 ex., 2. ix. 1988; 1 ex., 9. ix. 1988.

Anomala cuprea (Hope)

Specimens examined. Korimoto: 3 exx., 27. v. 1988. Shimota: 3 exx., 15. vi. 1988.

Blitopertha orientalis (Waterhouse)

Specimens examined. Korimoto: 2 exx., 4. vii. 1988. Shimota: 2 exx., 15. vi. 1988.

Mimela splendens (Gyllenhal)

Specimens examined. Shimota: 2 exx., 31. v. 1990.

Popillia japonica Newman

Specimens examined. Shimota: 3 exx., 8. ix. 1988.

Dermestidae

Anthrenus verbasci (Linnaeus)

Specimens examined. Emerged in the laboratory from seeds obtained from a seed dealer: 5 exx., 23. vii. 1989; 3 exx., 13. viii. 1989; 2 exx., 15. ix. 1989.

Nitidulidae

Haptoncurina paulula (Reiter)

Specimens examined. Shimota: 3 exx., 3. x. 1988.

Chrysomelidae

Pagria signata (Motschulsky)

Specimens examined. Korimoto: 5 exx., 20. v. 1988. Toso: 3 exx., 4. vi. 1988. Shimota: 5 exx., 24. vi. 1988.

Curculionidae

Episomus turritus (Gyllenhal)

Specimens examined. Toso: 1 ex., 9. v. 1988; 1 ex., 19. vii. 1988. Shimota: 3 exx., 31. v. 1988; 2 exx., 15. vi. 1988; 2 exx., 24. vi. 1988.

Sympiezomias lewisi (Roelofs)

Specimens examined. Toso: 3 exx., 4. vi. 1988; 1 ex., 24. vi. 1988.

Heterarthrus lewisi (Pascoe)

Specimen examined. Shimota: 1 ex., 31. v. 1990.

Lepidoptera

Tortricidae

Matsumuraeses falcana (Walsingham)

Specimens examined. Shimota: 1 ex., 3. v. 1988; 2 exx., 18. v. 1988.

Psychidae

Acanthopsyche nigraplaga (Wileman)

Specimens examined. Shimota: 1 ex., 5. x. 1988; 1 ex., 8. x. 1988; 1 ex., 19. x. 1988.

Pyralidae

Hedylepta misera (Butler)

Specimens examined. Korimoto: 1 ex., 8. v. 1988. Toso: 1 ex., 30. iv. 1988; 1 ex., 3. v. 1988.

Maruca testulalis (Hübner)

Specimens examined. Shimota: 4 exx., 8. ix. 1988; 3 exx., 12. ix. 1988; 4 exx., 22. ix. 1988; 2 exx., 30. ix. 1988; 2 exx., 3. x. 1988. Toso: 1 ex., 3. ix. 1988; 1 ex., 8. ix. 1988; 2 exx., 30. ix. 1988.

Noctuidae

Paragabara flavomaculata (Oberthür)

Specimens examined. Toso: 2 exx., 11. vi. 1988; 1 ex., 19. viii. 1988.

Table 1-a. List of phytophagous insects of Kudzu plant, *Pueraria lobata* (Willd.) Ohwi¹⁾

| Species | Host plant ²⁾ | Plant part affected ³⁾ | Distribution ⁴⁾ | Reference ⁵⁾ |
|--|--|-----------------------------------|---|-------------------------|
| I INSECTA | | | | |
| ORTHOPTERA | | | | |
| Tettigoniidae | | | | |
| * <i>Gampsocleis buergeri</i> (de Haan) | ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Gladiolus hybridus</i> Hort. | Leaf | Japan (Honshu, Shikoku, Kyushu, Tsu-shima) | 46 Present data |
| Pyrgomorphidae | | | | |
| * <i>Atractomorpha lata</i> (Motschulsky) | <i>Glycine max</i> Merrill <i>Vigna angularis</i> (Willd.) Ohwi et Ohashi <i>Phaseolus vulgaris</i> L. ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Dahlia jurezii</i> Hort. <i>Chrysanthemum morifolium</i> Ram. | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsu-shima, Yaku-shima, Ryukyus, Izu-oshima), Taiwan, Korea, Oriental region | 14, 46 Present data |
| Acrididae | | | | |
| * <i>Acrida cinerea</i> (Thunberg) | ** <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | Japan (Honshu, Shikoku, Kyushu, Tsu-shima, Ryukyus, Izu-oshima), Europe, Africa, Oriental region, Australian region | Present data |
| * <i>Oxya japonica japonica</i> (Thunberg) | ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Oryza sativa</i> L. <i>Saccharum officinarum</i> L. etc. | Leaf | Japan (Honshu, Shikoku, Kyushu, Tanega-shima, Yaku-shima, Ryukyus), Taiwan, Oriental region | 46 Present data |
| * <i>Patanga japonica</i> (Bolivar) | <i>Glycine max</i> Merrill <i>Vigna angularis</i> (Willd.) Ohwi et Ohashi <i>Phaseolus vulgaris</i> L. | Leaf | Japan (Honshu, Shikoku, Kyushu, Tsu-shima, Ryukyus), Taiwan, Korea, China, India, Himalaya, | 46 Present data |

1) Published records and the present data.

2) Species names after Makino³⁷⁾.

3) Plant part of Kudzu affected. That of some species is not available in the published records.

4) After Hirashima¹²⁾.

5) References which recorded Kudzu feeding and other host plant feeding. Numbers indicate those in the literature list of text.

* Feeding on Kudzu in Kagoshima city.

** New host plant recorded.

Table 1-a. (Continued)

| Species | Host plant ²⁾ | Plant part affected ³⁾ | Distribution ⁴⁾ | Reference ⁵⁾ |
|---|---|-----------------------------------|--|-------------------------|
| | ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Oryza sativa</i> L. <i>Triticum aestivum</i> L. <i>Setaria</i> spp. etc. | | Sikkim | |
| Tetrigidae | | | | |
| * <i>Tetrix japonica</i> (Bolivar) | <i>Brassica</i> spp. ** <i>Pueraria lobata</i> (Willd.) Ohwi Leguminous plants <i>Solanum tuberosum</i> L. <i>Zea mays</i> L. <i>Zoysia japonica</i> Steud. etc. | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Iki, Tsu-shima, Ryukyus), Saghalien, China, Taiwan, Mongolia, USSR | 46 Present data |
| HEMIPTERA-HOMOPTERA | | | | |
| Flatidae | | | | |
| * <i>Geisha distinctissima</i> (Walker) | <i>Castanea crenata</i> Sieb. et Zucc. <i>Morus bombycis</i> Koidz. <i>Paeonia suffruticosa</i> Andr. <i>Prunus mume</i> Sieb. et Zucc. ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. <i>Camellia sinensis</i> (L.) O. Kuntze <i>Diospyros kaki</i> Thunb. etc. | Stem, petiole | Japan (Honshu, Shikoku, Kyushu, Tsu-shima, Yaku-shima, Ryukyus), Taiwan, China | 40, 46 Present data |
| Ricaniidae | | | | |
| * <i>Orosanga japonica</i> (Melichar) | <i>Morus bombycis</i> Koidz. <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Vigna angularis</i> (Willd.) Ohwi et Ohashi <i>Phaseolus vulgaris</i> L. <i>Glycine max</i> Merrill ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. <i>Camellia sinensis</i> (L.) O. Kuntze | Stem, petiole | Japan (Honshu, Shikoku, Kyushu, Ryukyus), Taiwan, Korea | 40, 46 Present data |

| | | | | | |
|--------------|--|------------------|---|------------------------|--|
| | <i>Diospyros kaki</i> Thunb, etc. | | | | |
| Cercopidae | ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Chrysanthemum</i> spp. | Stem, petiole | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsu-shima, Yaku-shima), Taiwan, Korea, USSR | 40 Present data | |
| Penthimiidae | <i>Castanea crenata</i> Sieb. et Zucc. <i>Pyrus pyrifolia</i> (Burm.) var. <i>culta</i> Nakai ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. <i>Diospyros kaki</i> Thunb. | Leaf | Japan (Honshu, Shikoku, Kyushu, Ryukyus), Taiwan, Korea, China, USSR | 46 Present data | |
| Cicadellidae | <i>Morus bombycis</i> Koidz. <i>Ficus carica</i> L. <i>Arachis hypogaea</i> L. <i>Glycine max</i> Merrill <i>Vigna angularis</i> (Willd.) Ohwi et Ohashi <i>Phaseolus vulgaris</i> L. ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. <i>Vitis vinifera</i> L. <i>Camellia sinensis</i> (L.) O. Kuntze <i>Diospyros kaki</i> Thunb. etc. | Leaf | Japan (Honshu, Shikoku, Kyushu, Tsu-shima) | 46 Present data | |
| | * <i>Cicadella viridis</i> (Linnaeus) | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu), Taiwan, Palearctic region | 40, 46 Present data | |
| | ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Diospyros kaki</i> Thunb. <i>Gladiolus gandavensis</i> van Houtt | | | | |

Table 1-a. (Continued)

| Species | Host plant ²⁾ | Plant part affected ³⁾ | Distribution ⁴⁾ | Reference ⁵⁾ |
|--------------------------------|---|-----------------------------------|---|-------------------------|
| Typhlocybiidae | <i>Oryza sativa</i> L. <i>Triticum aestivum</i> L. <i>Hordeum vulgare</i> L. var. <i>vulgare</i> <i>Secale cereale</i> L. <i>Saccharum officinarum</i> L. <i>Zea mays</i> L. etc. | | | |
| * <i>Empoasca</i> sp. | ** <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | | Present data |
| Aphididae | <i>Astragalus sinicus</i> L. <i>Robinia pseudo-acacia</i> L. <i>Vicia faba</i> L. <i>V. hirsuta</i> (L.) <i>Pisum sativum</i> L. <i>Vigna angularis</i> (Wild.) Ohwi et Ohashi <i>Pueraria lobata</i> (Willd.) Ohwi etc. | Leaf, stem | Japan (Hokkaido, Honshu, Shikoku, Kyushu), cosmopolitan | 11, 40, 46 |
| Ortheziidae | <i>Salix</i> spp. <i>Polygonum Blumei</i> Meisn. <i>Akebia quina</i> Decne <i>Lespedeza</i> spp. <i>Pueraria lobata</i> (Willd.) Ohwi etc. | Leaf | Japan (Honshu, Shikoku, Kyushu), Korea, Taiwan | 21 |
| Eriococcidae | <i>Indigofera pseudo-inctoria</i> Matsum. <i>Desmodium podocarpum</i> DC. subsp. <i>fallax</i> Schindl. <i>Lespedeza buergeri</i> Miq. <i>Glycine max</i> Merrill <i>Pueraria lobata</i> (Willd.) Ohwi etc. | Stem | Japan (Honshu, Shikoku, Kyushu) | 21, 46 |
| <i>Eriococcus sojae</i> Kuwana | | | | |

| | | | | | |
|--|---|------|--|--------|--------------|
| Diaspidae | | | | | |
| * <i>Pseudaulacaspis pentagona</i> (Targioni) | <i>Salix</i> spp. <i>Juglans mandshurica</i> Maxim. var. <i>sachalinensis</i> (Miyabe et Kudo) <i>Morus bombycis</i> Koidz. <i>Pyrus pyrifolia</i> (Burm.) var. <i>culta</i> Nakai <i>Prunus persica</i> Batsch <i>Pueraria lobata</i> (Willd.) Ohwi <i>Zanthoxylum piperitum</i> (L.) DC. <i>Camellia sinensis</i> (L.) O. Kuntze. <i>Diospyros kaki</i> Thunb. <i>Cycas revoluta</i> Thunb. etc. | Stem | Japan (Honshu, Shikoku, Kyushu, Nansei-shoto), cosmopolitan | 21, 46 | |
| HEMIPTERA-HETEROPTERA | | | | | |
| Miridae | | | | | |
| * <i>Adelphocoris triannulatus</i> (Stål) | <i>Indigofera pseudo-tinctoria</i> Matsum. ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Cucumis melo</i> L. <i>Chrysanthemum</i> spp. <i>Oryza sativa</i> L. <i>Lolium multiflorum</i> Lam. <i>Allium tuberosum</i> Rottl. | Leaf | Japan (Hokkaido, Shikoku, Kyushu), Korea, China, Saghalien, Kuriles | 22 | Present data |
| * <i>Ectometopterus micanulus</i> (Horváth) | <i>Indigofera pseudo-tinctoria</i> Matsum. <i>Pueraria lobata</i> (Willd.) Ohwi <i>Cucumis melo</i> L. <i>Chrysanthemum</i> spp. <i>Oryza sativa</i> L. <i>Lolium multiflorum</i> Lam. <i>Allium tuberosum</i> Rottl. | Leaf | Japan (Honshu, Shikoku, Kyushu) | 22 | |
| <i>Probosciodocoris varicornis</i> (Jakovlev) | <i>Pueraria lobata</i> (Willd.) Ohwi | | Japan (Honshu, Kyushu, Tsu-shima), Korea, Oriental region | 22 | |
| * <i>Halticillus insularis</i> (Usinger) | <i>Raphanus sativus</i> L. <i>Arachis hypogaea</i> L. <i>Pueraria lobata</i> (Willd.) Ohwi <i>Ipomoea batatas</i> Lam. <i>Cucumis melo</i> L. etc. | Leaf | Japan (Tsu-shima, Ryukyus), Taiwan, Micronesia | 22, 38 | |
| <i>Pilophorus typicus</i> (Distant) | <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | Japan (Honshu, Shikoku, Kyushu, | 22 | |

Table 1-a. (Continued)

| Species | Host plant ²⁾ | Plant part affected ³⁾ | Distribution ⁴⁾ | Reference ⁵⁾ |
|--|---|-----------------------------------|---|-------------------------|
| | <i>Oryza sativa</i> L. | | Ryukyus, Taiwan, China, Oriental region | |
| Berytidae | | | | |
| * <i>Metacanthus pulchellus</i> Dallas | ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Paulownia tomentosa</i> Steudel <i>Sesamum indicum</i> L. | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu), China, India | 22 Present data |
| <i>Yemma exilis</i> Horváth | <i>Glycine max</i> Merrill <i>Pueraria lobata</i> (Willd.) Ohwi <i>Paulownia tomentosa</i> Steudel <i>Sesamum indicum</i> L. <i>Setaria viridis</i> Beauv. etc. | Leaf, stem, ear | Japan (Honshu, Shikoku, Kyushu) | 22 |
| Lygaeidae | | | | |
| * <i>Nysius plebejus</i> Distant | <i>Rumex Acetosa</i> L. <i>Fragaria</i> spp. ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Erigeron philadelphicus</i> L. <i>Chrysanthemum morifolium</i> Ram. <i>Oryza sativa</i> L. <i>Agropyron kamoji</i> Ohwi <i>Lolium multiflorum</i> Lam. <i>Eleusine indica</i> (L.) Gaertn. <i>Setaria viridis</i> Beauv. etc. | Leaf | Japan (Honshu, Shikoku, Kyushu, Ryukyus), Midway Is. | 22 Present data |
| * <i>Piocoris varius</i> (Uhler) | <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus junos</i> Sieb. ex Tanaka <i>Erigeron annuus</i> L. <i>Chrysanthemum</i> spp. Aphids, scale insects etc. | | Japan (Honshu, Shikoku, Kyushu, Ryukyus), Korea | 22 |
| * <i>Chauliops fallax</i> Scott | <i>Desmodium</i> spp. <i>Glycine max</i> Merrill <i>Amphicarpaea edgeworthii</i> Benth. | Leaf, flower | Japan (Honshu, Shikoku, Kyushu, Ryukyus), Taiwan, China, Sri Lanka, India | 22, 25, 50, 62 |

| | | | | | | |
|---|---|---------------------------|---|------------------------|--|--|
| Alydidae | | | | | | |
| * <i>Riptortus clavatus</i> (Thunberg) | <i>Vigna angularis</i> (Wild.) Ohwi et Ohashi <i>Pueraria lobata</i> (Willd.) Ohwi <i>Oryza sativa</i> L. | Stem, flower, pod | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Nansei-shoto), Taiwan, Korea | 22, 25 Present data | | |
| | ** <i>Pueraria lobata</i> (Willd.) Ohwi Leguminous plants <i>Citrus</i> spp. <i>Ipomoea batatas</i> Lam. <i>Sesamum indicum</i> L. etc. | | | | | |
| Coreidae | | | | | | |
| * <i>Cletus trigonus</i> (Thunberg) | ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Oryza sativa</i> L. <i>Setaria viridis</i> L. <i>Digitaria ciliaris</i> (Retz.) <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Glycine max</i> Merrill <i>Vigna angularis</i> (Willd.) Ohwi et Ohashi <i>Pueraria lobata</i> (Willd.) Ohwi etc. | Leaf, stem, petiole | Japan (Honshu, Shikoku, Kyushu, Nansei-shoto), Taiwan, China, Oriental region | 22 Present data | | |
| | <i>Homoeocerus dilatatus</i> Horváth | | Japan (Hokkaido, Honshu, Shikoku, Kyushu), Korea, China, E. Siberia | 22 | | |
| * <i>H. unipunctatus</i> (Thunberg) | <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Lespedeza cuneata</i> G. Don <i>Glycine max</i> Merrill <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. <i>Oryza sativa</i> L. <i>Morus bombycis</i> Koidz. <i>Rumex japonicus</i> Houtt. <i>Pueraria lobata</i> (Willd.) Ohwi <i>Oryza sativa</i> L. etc. | Leaf, stem, petiole | Japan (Honshu, Shikoku, Kyushu, Ryukyus), Taiwan, China, Oriental region | 22 | | |
| | <i>Hygia (Hygia) opeca</i> (Uhler) | | Japan (Honshu, Shikoku, Kyushu, Ryukyus), Korea, Taiwan, China | 22 | | |
| * <i>Stictopleurus punctatonevus</i> Goeze | ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Oryza sativa</i> L. | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu) | 22 Present data | | |
| Plataspidae | | | | | | |
| <i>Coptosoma biguttulum</i> Motschulsky | <i>Lespedeza</i> spp. <i>Glycine max</i> Merrill <i>Vigna angularis</i> (Willd.) Ohwi et Ohashi | | Japan (Hokkaido, Shikoku, Kyushu), Korea, China, E. Siberia | 22 | | |

Table 1-a. (Continued)

| Species | Host plant ²⁾ | Plant part affected ³⁾ | Distribution ⁴⁾ | Reference ⁵⁾ |
|---|--|-------------------------------------|--|-------------------------|
| | <i>Pueraria lobata</i> (Willd.) Ohwi etc. | | | |
| * <i>Megacopta punctatissima</i> (Montandon) | <i>Deutzia crenata</i> Sieb. et Zucc. <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Astragalus sinicus</i> L. <i>Lespedeza</i> spp. <i>Glycine max</i> Merrill <i>Vigna angularis</i> (Willd.) Ohwi et Ohashi <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. <i>Oryza sativa</i> L. <i>Triticum aestivum</i> L. etc. | Stem, petiole, flower, pod | Japan (Honshu, Shikoku, Kyushu, Tsu-shima), China | 10, 22, 63 |
| Dinidridae | | | | |
| <i>Megymenum gracilicorne</i> Dallas | <i>Pueraria lobata</i> (Willd.) Ohwi <i>Cucumis melo</i> L. <i>C. sativus</i> L. <i>Trichosanthes cucumeroides</i> Maxim. etc. | | Japan (Honshu, Shikoku, Kyushu, Ryukyus), Korea, Taiwan, China | 22 |
| Pentatomidae | | | | |
| <i>Dolycoris baccalum</i> (L.) | <i>Oryza sativa</i> L. <i>Glycine max</i> Merrill <i>Phaseolus vulgaris</i> L. <i>Pueraria lobata</i> (Willd.) Ohwi etc. | | Japan (Hokkaido, Honshu, Shikoku, Kyushu), Korea, China, Palearctic region | 22, 25 |
| * <i>Eysarcoris ventralis</i> (Westwood) | <i>Glycine max</i> Merrill ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Oryza sativa</i> L. <i>Agropyron kamoji</i> Ohwi <i>Lolium multiflorum</i> Lam. <i>Eleusine indica</i> Gaertn. <i>Setaria italica</i> Beauv. etc. | Leaf | Japan (Honshu, Kyushu, Nansei- shoto), Oriental region | 22 Present data |

| | | | |
|--------------------------------------|---|---|--------|
| <i>Halyomorpha picus</i> (Fabricius) | <i>Robinia pseudo-acacia</i> L. <i>Vigna angularis</i> (Wild.) Ohwi et Ohashi <i>Phaseolus vulgaris</i> L. <i>Glycine max</i> Merrill <i>Pueraria lobata</i> (Willd.) Ohwi <i>Vitis vinifera</i> L. <i>Triticum aestivum</i> L. etc. | Japan (Honshu, Shikoku, Kyushu, Ryukyus), Taiwan, Korea, China, Oriental region | 22 |
| <i>Homalagonia obtusa</i> (Walker) | <i>Malus</i> spp. <i>Prunus persica</i> Batsch <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Pisum sativum</i> L. <i>Glycine max</i> Merrill <i>Phaseolus vulgaris</i> L. <i>Pueraria lobata</i> (Willd.) Ohwi etc. | Japan (Hokkaido, Honshu, Shikoku, Kyushu), Korea, China, E. Siberia | 22 |
| <i>Menida violacea</i> Motschulsky | <i>Morus bombycis</i> Koidz. <i>Oryza sativa</i> L. <i>Robus crataegifolius</i> Bunge <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Pueraria lobata</i> (Willd.) Ohwi etc. | Japan (Hokkaido, Honshu, Shikoku, Kyushu), Korea, China, E. Siberia | 22 |
| <i>Nezara antennata</i> Scott | <i>Vicia faba</i> L. <i>Glycine max</i> Merrill <i>Vigna angularis</i> (Wild.) Ohwi et Ohashi <i>Phaseolus vulgaris</i> L. <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. <i>Triticum aestivum</i> L. etc. | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Nansei-shoto), Taiwan, China, Korea, India, Indochina | 22, 25 |
| <i>Piezodorus hybneri</i> (Gmelin) | <i>Medicago polymorpha</i> L. <i>Laspedeza</i> spp. <i>Vicia faba</i> L. <i>Glycine max</i> Merrill <i>Phaseolus vulgaris</i> L. <i>Pueraria lobata</i> (Willd.) Ohwi <i>Veronica</i> spp. <i>Oryza sativa</i> L. etc. | Japan (Honshu, Shikoku, Kyushu, Nansei-shoto), Taiwan, China, India, Australia | 22, 25 |

Table 1-a. (Continued)

| Species | Host plant ²⁾ | Plant part affected ³⁾ | Distribution ⁴⁾ | Reference ⁵⁾ |
|--|---|-----------------------------------|--|-------------------------|
| THYSANOPTERA | | | | |
| Thripidae | | | | |
| <i>Salpingothrips aimotofus</i> Kudo | <i>Pueraria lobata</i> (Willd.) Ohwi | Flower | Japan (Honshu), Taiwan, Kainan-to | 28 |
| <i>Thrips coloratus</i> Schmutz | <i>Ficus carica</i> L. <i>Vicia faba</i> L. <i>Pisum sativum</i> L. <i>Vigna angularis</i> (Willd.) Ohwi et Ohashi <i>Pueraria lobata</i> (Willd.) Ohwi <i>Vitis vinifera</i> L. <i>Camellia sinensis</i> (L.) O. Kuntze <i>Diospyros kaki</i> Thunb. <i>Nicotiana tabacum</i> L. etc. | | Japan (Honshu, Shikoku, Kyushu), China, S. E. Asia, India, Sri Lanka, New Guinea | 64 |
| * <i>Thrips hawaiiensis</i> (Morgan) | <i>Camellia sinensis</i> (L.) O. Kuntze <i>Brassica campestris</i> L. <i>Glycine max</i> Merrill <i>Vigna angularis</i> (Willd.) Ohwi et Ohashi ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp <i>Cucumis sativa</i> L. <i>Lycopersicon esculentum</i> Mill. <i>Nicotiana tabacum</i> L. <i>Allium fistulosum</i> L. <i>Oryza sativa</i> L. <i>Saccharum officinarum</i> L. etc. | Flower | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Ryukyus), Taiwan, China, S. E. Asia, India, New Guinea, Micronesia, Hawaii, Europe. | 41, 64 Present data |
| * <i>Megalurothrips distalis</i> (Karny) | <i>Vicia faba</i> L. <i>Glycine max</i> Merrill ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. <i>Luffa aegyptiaca</i> Mill. <i>Diospyros kaki</i> Thunb. <i>Ipomaea batatas</i> Lam. | Flower | Japan (Honshu, Shikoku, Kyushu, Ryukyus), Taiwan, China, S. E. Asia, India, Sri Lanka. | 41, 64 Present data |

| | | | | |
|--|--|--------|---|--------------------|
| | <i>Chrysanthemum morifolium</i> Ramat. | | | |
| | <i>Allium cepa</i> L. | | | |
| | etc. | | | |
| COLEOPTERA | | | | |
| Scarabaeidae | | | | |
| * <i>Anomala cuprea</i> (Hope) | <i>Quercus</i> sp. | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsu-shima, Tanegashima, Yaku-shima) | 46 Present data |
| | <i>Fragaria x-magna</i> Thuill | | | |
| | <i>Rosa</i> spp. | | | |
| | <i>Prunus</i> spp. | | | |
| | <i>Albizia julibrissin</i> Durazz. | | | |
| | <i>Glycine max</i> Merrill | | | |
| | <i>Vigna angularis</i> (Willd.) | | | |
| | <i>V. unguiculata</i> (L.) | | | |
| | ** <i>Pueraria lobata</i> (Willd.) Ohwi | | | |
| | <i>Citrus</i> spp. | | | |
| | <i>Diospyros kaki</i> Thunb. | | | |
| | <i>Ipomoea batatas</i> Lam. | | | |
| | <i>Arctium lappa</i> L. | | | |
| | <i>Iris</i> spp. | | | |
| | etc. | | | |
| * <i>A. lucens</i> Ballion | <i>Glycine max</i> Merrill | Leaf, | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Yaku-shima) | 46 Present data |
| | <i>Vigna angularis</i> (Willd.) Ohwi et Ohashi | flower | | |
| | <i>Phaseolus vulgaris</i> L. | | | |
| | ** <i>Pueraria lobata</i> (Willd.) Ohwi | | | |
| | <i>Zea mays</i> L. | | | |
| | <i>Picea jezoensis</i> Carr. | | | |
| | <i>Abies sachalinensis</i> (Fr. Schm.) | | | |
| | <i>Pinus thunbergii</i> Parl. | | | |
| * <i>Bliptpertha orientalis</i> (Waterhouse) | <i>Rosa</i> sp. | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu) | 46 Present data |
| | <i>Prunus</i> spp. | | | |
| | ** <i>Pueraria lobata</i> (Willd.) Ohwi | | | |
| | <i>Citrus</i> spp. | | | |
| | <i>Diospyros kaki</i> Thunb. | | | |
| | <i>Zoysia</i> spp. | | | |
| * <i>Mimela splendens</i> (Gyllenhal) | <i>Rosa</i> spp. | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu) | 46 Present data |
| | ** <i>Pueraria lobata</i> (Willd.) Ohwi | | | |
| | <i>Carnellia sinensis</i> (L.) O. Kuntze. | | | |
| | <i>Diospyros kaki</i> Thunb. | | | |

Table 1-a. (Continued)

| Species | Host plant ²⁾ | Plant part affected ³⁾ | Distribution ⁴⁾ | Reference ⁵⁾ |
|---|--|-----------------------------------|--|-------------------------|
| * <i>Popillia japonica</i> Newman | <i>Castanea crenata</i> Sieb. et Zucc. <i>Malus</i> spp. <i>Rosa</i> spp. <i>Prunus</i> spp. <i>Glycine max</i> Merrill ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Vitis vinifera</i> L. <i>Diospyros kaki</i> Thunb. <i>Dahlia juorezii</i> Hort. <i>Asparagus officinalis</i> L. var. <i>atilis</i> L. etc. | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsu-shima, Yaku-shima) | 46 Present data |
| Buprestidae | | | | |
| * <i>Trachys auricollis</i> E. Saunders | <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | Japan (Honshu, Shikoku, Kyushu, Sado, Tanega-shima, Yaku-shima) | 34, 35 |
| <i>T. reitteri</i> Obenberger | <i>Glycine max</i> Merrill <i>Amphicarpaea edgeworthii</i> Benth. <i>Pueraria lobata</i> (Willd.) Ohwi etc. | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu), Korea, China | 34, 35 |
| Dermeestidae | | | | |
| * <i>Anthrenus verbasci</i> (Linnaeus) | Dried specimen, woolen cloth, etc. ** <i>Pueraria lobata</i> (Willd.) Ohwi | Stored seed | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Ryukyus), cosmopolitan | 45, 46 Present data |
| Nitidulidae | | | | |
| * <i>Haptoncurina paulula</i> (Reitter) | ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. <i>Poncirus trifoliata</i> (L.) <i>Fortunella</i> spp. | Flower | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Sado, Izu-shoto, Tsu-shima, Goto-retto, Tanega-shima, Yaku-shima, Ryukyus), Taiwan, China, Bhutan, USSR. | 46 Present data |
| Cerambycidae | | | | |
| <i>Falsomesosella gracilior</i> (Bates) | <i>Pterocarya rhoifolia</i> Sieb. et Zucc. <i>Alnus hirsuta</i> (Turcz.) <i>Zelkova serrata</i> Makino | Stem | Japan (Honshu, Shikoku, Kyushu, Tsu-shima) | 26 |

| | | | | |
|---|--|------|--|----|
| <i>Morus bombycis</i> Koidz. | | | | |
| <i>Prunus</i> spp. | | | | |
| <i>Wistaria brachybotrys</i> Sieb. et Zucc. | | | | |
| <i>Robinia pseudo-acacia</i> L. | | | | |
| <i>Pueraria lobata</i> (Willd.) Ohwi | | | | |
| <i>Abies firma</i> Sieb. et Zucc. | | | | |
| etc. | | | | |
| <i>Castanea crenata</i> Sieb. et Zucc. | | Stem | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Iki, Tanega-shima, Yakushima, Ryukyus) | 26 |
| <i>Quercus</i> spp. | | | | |
| <i>Zelkova serrata</i> Makino | | | | |
| <i>Morus bombycis</i> Koidz. | | | | |
| <i>Prunus</i> spp. | | | | |
| <i>Wistaria brachybotrys</i> Sieb. et Zucc. | | | | |
| <i>Pueraria lobata</i> (Willd.) Ohwi | | | | |
| <i>Citrus</i> spp. | | | | |
| <i>Pinus densiflora</i> Sieb. et Zucc. | | | | |
| etc. | | | | |
| <i>Castanea crenata</i> Sieb. et Zucc. | | Stem | Japan (Tsu-shima), Korea, Saghalien | 26 |
| <i>Quercus</i> spp. | | | | |
| <i>Zelkova serrata</i> Makino | | | | |
| <i>Morus bombycis</i> Koidz. | | | | |
| <i>Malus</i> spp. | | | | |
| <i>Wistaria brachybotrys</i> Sieb. et Zucc. | | | | |
| <i>Pueraria lobata</i> (Willd.) Ohwi | | | | |
| <i>Tsuga sieboldii</i> Carr. | | | | |
| etc. | | | | |
| <i>Quercus</i> spp. | | Stem | Japan (Okushiri, Honshu, Shikoku, Kyushu, Tsu-shima), Palawan, Vietnam | 26 |
| <i>Zelkova serrata</i> Makino | | | | |
| <i>Wistaria brachybotrys</i> Sieb. et Zucc. | | | | |
| <i>Pueraria lobata</i> (Willd.) Ohwi | | | | |
| <i>Acer rufinerve</i> Sieb. et Zucc. | | | | |
| <i>Trichosanthes cucumeroides</i> Maxim. | | | | |
| <i>Phyllostachys</i> spp. | | | | |
| <i>Pleioblastus</i> spp. | | | | |
| etc. | | | | |
| <i>Juglans mandshurica</i> Maxim. | | Stem | Japan (Honshu, Shikoku, Kyushu, Tsu-shima, Iki) | 26 |
| var. <i>sieboldiana</i> Makino | | | | |
| <i>Alnus hirsuta</i> (Turcz.) | | | | |
| <i>Castanea crenata</i> Sieb. et Zucc. | | | | |
| <i>Mesosa longipennis</i> Bates | | | | |
| <i>M. myops myops</i> (Dalman) | | | | |
| * <i>Atimura japonica</i> Bates | | | | |
| <i>Mesosella similiola</i> Bates | | | | |

Table 1-a. (Continued)

| Species | Host plant ²⁾ | Plant part affected ³⁾ | Distribution ⁴⁾ | Reference ⁵⁾ |
|---|---|-----------------------------------|--|-------------------------|
| | <i>Zelkova serrata</i> Makino <i>Morus bombycis</i> Koidz. <i>Pueraria lobata</i> (Willd.) Ohwi <i>Melia azedarach</i> L. var. <i>subiripinnata</i> Mig. <i>Vitis coignetiae</i> Pulliat <i>Abies firma</i> Sieb. et Zucc. etc. | | | |
| <i>Pterolophia annulata</i> (Chevrolat) | <i>Castanea crenata</i> Sieb. et Zucc. <i>Quercus</i> spp. <i>Zelkova serrata</i> Makino <i>Morus bombycis</i> Koidz. <i>Ficus carica</i> L. <i>Prunus yedoensis</i> spp. <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Pueraria lobata</i> (Willd.) Ohwi <i>Vitis vinifera</i> L. etc. | Stem | Japan (Honshu, Shikoku, Kyushu, Iki, Tsu-shima, Ogasawara, Ryukyus), Taiwan, China, Korea, Burma | 26 |
| <i>P. caudata caudata</i> Bates | <i>Castanea crenata</i> Sieb. et Zucc. <i>Quercus</i> spp. <i>Zelkova serrata</i> Makino <i>Morus bombycis</i> Koidz. <i>Ficus carica</i> L. <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. <i>Aesculus turbinata</i> Blume etc. | Stem | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsu-shima, Iki, Tanega-shima) | 26 |
| <i>P. zonata</i> (Bates) | <i>Castanea crenata</i> Sieb. et Zucc. <i>Quercus</i> spp. <i>Morus bombycis</i> Koidz. <i>Ficus carica</i> L. <i>Hydrangea macrophylla</i> (Thunb.) <i>Prunus persica</i> Batsh | Stem | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tanega-shima, Yaku-shima) | 26 |

| | | | | | |
|---------------|--|--|---------------|---|------------------------|
| | <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. <i>Cryptomeria japonica</i> (L.) D. Don etc. | | | | |
| Bruchidae | | | | | |
| | <i>Callosobruchus ademptus</i> (Sharp) | <i>Pueraria lobata</i> (Willd.) Ohwi <i>Torilis japonica</i> (Houtt.) DC. | Seed | Japan (Honshu, Kyushu) | 43 |
| Chrysomelidae | | | | | |
| | * <i>Pagria signata</i> (Motschulsky) | <i>Glycine max</i> Merrill ** <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | Japan (Honshu, Shikoku, Kyushu, Ryukyus, Ogasawara), Korea, China, USSR, Taiwan, Indochina, Philippines, Guam, Indonesia, India | 23, 46 Present data |
| Curculionidae | | | | | |
| | * <i>Episomus turritus</i> (Gyllenhal) | <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Lespedeza</i> spp. ** <i>Pueraria lobata</i> (Willd.) Ohwi Leguminous plants | Leaf, stem | Japan (Honshu, Shikoku, Kyushu, Tsu-shima), Korea, China | 43, 46 Present data |
| | * <i>Sympiezomias lewisi</i> (Roelofs) | <i>Morus bombycis</i> Koidz. ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. etc. | Leaf | Japan (Honshu, Shikoku, Kyushu) | 43 Present data |
| | * <i>Eugnathus distinctus</i> Roelofs | <i>Lespedeza</i> spp. <i>Glycine max</i> Merrill <i>Pueraria lobata</i> (Willd.) Ohwi Leguminous plants | Leaf, stem | Japan (Honshu, Shikoku, Kyushu, Ryukyus), China, Taiwan, Korea | 43, 46 |
| | <i>Mesalcidodes trifidus</i> (Pascoe) | <i>Pueraria lobata</i> (Willd.) Ohwi <i>Pyrus</i> spp. <i>Citrus</i> spp. | Stem, petiole | Japan (Honshu, Shikoku, Kyushu, Tsu-shima), Taiwan, China | 42, 43, 46 |
| | * <i>Heterarthrus lewisi</i> Wollaston | <i>Wistaria brachybotrys</i> Sieb. et Zucc. ** <i>Pueraria lobata</i> (Willd.) Ohwi | Withered stem | Japan (Honshu, Shikoku, Kyushu, Tsu-shima) | 43 Present data |
| DIPTERA | | | | | |
| Cecidomyiidae | | | | | |
| | <i>Lasioptera puerariae</i> Shinji * <i>Pitydiplosis</i> sp. | <i>Pueraria lobata</i> (Willd.) Ohwi <i>Pueraria lobata</i> (Willd.) Ohwi | Stem Leaf | Japan (Honshu), Korea Japan (Honshu, Kyushu, Nansei-shoto, Ryukyus) | 70 69, 71, 72 |

Table 1-a. (Continued)

| Species | Host plant ²⁾ | Plant part affected ³⁾ | Distribution ⁴⁾ | Reference ⁵⁾ |
|---|--|-----------------------------------|---|-------------------------|
| * Genus sp. | <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | Japan (Honshu, Kyushu, Nansei-shoto, Ryukyus) | 69, 71, 72 |
| Agromyzidae | | | | |
| * <i>Japanagromyza tristella</i> (Thomson) | <i>Glycine max</i> Merrill <i>G. soja</i> Sieb. et Zucc. <i>Vigna angularis</i> (Willd.) Ohwi et Ohashi <i>Phaseolus vulgaris</i> L. <i>Vigna unguiculata</i> (L.) Walp. <i>Pueraria lobata</i> (Willd.) Ohwi etc. | Leaf | Japan (Honshu), Taiwan, China | 46, 48 |
| <i>Japanagromyza variihalterata</i> (Malloch) | <i>Pueraria lobata</i> (Willd.) Ohwi <i>Glycine soja</i> Sieb. et Zucc. | Leaf | Japan (Honshu) | 52 |
| <i>Ophiomyia puerarivora</i> Sasakawa | <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | Japan (Honshu) | 53 |
| LEPIDOPTERA | | | | |
| Tortricidae | | | | |
| * <i>Matsumuraeses falcana</i> (Walsingham) | <i>Robinia pseudo-acacia</i> L. <i>Glycine max</i> Merrill ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Zoysia japonica</i> Steud. | Leaf, young stem | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsu-shima, Izu-oshima, Yaku-shima, Okinawa), Taiwan, China, Nepal | 20, 51 Present data |
| <i>M. ussuriensis</i> (Caradja) | <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Glycine max</i> Merrill <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf, young stem | Japan (Honshu, Shikoku), USSR | 20, 39 |
| <i>M. vicina</i> Kuznetsov | <i>Glycine max</i> Merrill <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf, young stem | Japan (Honshu, Tsu-shima, Hachijo-jima), China | 20, 39, 47 |
| Psychidae | | | | |
| * <i>Acanthopsyche nigraplaga</i> (Wileman) | ** <i>Pueraria lobata</i> (Willd.) Ohwi <i>Diospyros kaki</i> Thunb. <i>Citrus</i> spp. | Leaf | Japan (Honshu, Shikoku, Kyushu), China, India | 13, 46 Present data |
| Lyonetiidae | | | | |
| <i>Leucoptera puerariella</i> Kuroko | <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | Japan (Honshu, Kyushu) | 32, 33 |
| <i>Microthama glycinella</i> (Hübner) | <i>Glycine max</i> Merrill | Leaf | Japan (Kyushu, Okinawa) | 32, 33, 39 |

| | | | | | | |
|--|---|-----------------|--|--------------------|--|--|
| Gracillariidae | | | | | | |
| * <i>Liocrobyla lobata</i> Kuroko | <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | Japan (Honshu, Shikoku, Kyushu) | 31, 33, 39 | | |
| * <i>Neolithocolletis hikomonticola</i> Kumata | <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | Japan (Honshu, Kyushu) | 29, 33, 39 | | |
| * <i>Spulerina dissotoma</i> (Meyrick) | <i>Lespedeza cyrtobotrya</i> Miq. | Leaf | Japan (Honshu, Kyushu), India | 30, 33 | | |
| <i>Hylaconis puerariae</i> Kumata | <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | Japan (Hokkaido, Honshu) | 29, 33, 39 | | |
| <i>Porphyosela dorinda</i> Meyrick | <i>Amphicarpaea edgeworthii</i> Benth. | Leaf | Japan (Yaku-shima), Taiwan, India | 29 | | |
| Pyralidae | <i>Pueraria lobata</i> (Willd.) DC. | Leaf | Japan (Yaku-shima), Taiwan, India | 29 | | |
| <i>Charema noctescens</i> Moore | <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsu-shima, Tanega-shima, Yaku-shima), Korea, Taiwan, China, India-Malaysia | 13, 15, 39 | | |
| * <i>Hedylecta misera</i> (Butler) | ** <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | Japan (Honshu, Shikoku, Kyushu, Tanega-shima, Yaku-shima), Korea, China | Present data | | |
| * <i>Maruca testulalis</i> (Hübner) | <i>Vigna angularis</i> (Willd.) Ohwi et Ohashi <i>V. unguiculata</i> (L.) Walp. ** <i>Pueraria lobata</i> (Willd.) Ohwi | Flower, petiole | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsu-shima, Yaku-shima, Ryukyus), Taiwan, China, Korea, India, Malaysia, Hawaii, Oceanic Is., Australia, Africa | 13 Present data | | |
| * <i>Pleuroptya punctimarginalis</i> (Hampson) | <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | Japan (Honshu, Kyushu, Okinawa), India, Malaysia | 39 | | |
| Lycaenidae | | | | | | |
| * <i>Lampides boeticus</i> (Linnaeus) | <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Vicia faba</i> L. <i>Pisum sativum</i> L. <i>Vigna angularis</i> (Willd.) Ohwi et Ohashi <i>Phaseolus vulgaris</i> L. <i>Pueraria lobata</i> (Willd.) Ohwi <i>P. montana</i> Merr. etc. | Flower, pod | Japan (Honshu, Shikoku, Kyushu, Ryukyus), Europe, Africa, Asia, New Guinea, Australia, Hawaii | 7, 46, 55 | | |
| <i>Celastrina argiolus ladonides</i> | <i>Sophora flavescens</i> Ait. | Leaf, | Japan (Hokkaido, Honshu, Shikoku, | 9 | | |

Table 1-a. (Continued)

| Species | Host plant ²⁾ | Plant part affected ³⁾ | Distribution ⁴⁾ | Reference ⁵⁾ |
|--|---|-----------------------------------|--|-------------------------|
| (de l'Orza) | <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Desmodium podocarpum</i> DC. subsp. <i>oxyphyllum</i> (DC.) Ohashi var. <i>oxyphyllum</i> Maxim. <i>Lespedeza thunbergii</i> (DC.) Nakai <i>L. bicolor</i> Turcz. <i>Vicia cracca</i> L. <i>Pueraria lobata</i> (Willd.) Ohwi <i>Cornus controversa</i> Hemsl. etc. | flower | Kyushu, Tsu-shima, Tanega-shima, Yaku-shima, Amami-oshima), Korea, China, Ussuri | |
| <i>Everes argiades helloitia</i> (Ménétrières) | <i>Medicago lupulina</i> L. <i>Sophora flavescens</i> Ait. f. <i>purpurascens</i> (Makino) <i>Indigofera pseudotinctoria</i> Matsum. <i>Vicia cracca</i> L. <i>V. sativa</i> L. <i>Astragalus sinicus</i> L. <i>Lotus corniculatus</i> L. var. <i>japonica</i> Regel <i>Pueraria lobata</i> (Willd.) Ohwi etc. | Flower | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsu-shima, Tanega- shima, Yaku-shima, Amami- oshima), Amur, Ussuri, Korea, China | 8 |
| <i>Rapala arata</i> (Bremer) | <i>Deutzea crenata</i> Sieb. et Zucc. <i>Pueraria lobata</i> (Willd.) Ohwi <i>Wistaria floribunda</i> (Willd.) DC. <i>Vicia cracca</i> L. <i>Lespedeza thunbergii</i> Nakai <i>Sophora flavescens</i> Ait. f. <i>purpurascens</i> (Makino) | Seed | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsu-shima), Amur, China, Korea | 8 |
| Curetidae | | | | |
| * <i>Curetis acuta paracuta</i> de Niceville | <i>Caesalpinia decapetala</i> (Roth) Alst. var. <i>japonica</i> Ohashi <i>Sophora flavescens</i> Ait. f. <i>purpurascens</i> (Makino) <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Robunia pseudo-acacia</i> L. | Leaf, stem, pod, bud | Japan (Honshu, Shikoku, Kyushu, Tsu-shima, Tanega-shima, Amami-oshima) | 7, 9, 55 |

| | | | | |
|--|---|------|--|----------------|
| Nymphalidae | | | | |
| <i>Neptis sappho intermedia</i> W. B. Pryer | <i>Pueraria lobata</i> (Willd.) Ohwi <i>P. montana</i> Merr. | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsu-shima, Yaku-shima), Amur, Ussuri, China, Korea | 7, 55 |
| | <i>Zelkova serrata</i> Makino <i>Celtis sinensis</i> Pers. var. <i>japonica</i> (Planch.) <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Robinia pseudo-acacia</i> L. <i>Lespedeza buergeri</i> Miq. <i>Vicia unijuga</i> Al. Br. <i>Glycine max</i> Merrill <i>Pueraria lobata</i> (Willd.) Ohwi <i>Firmiana simplex</i> (L.) etc. | | | |
| Geometridae | | | | |
| <i>Ascotis selenaria cretacea</i> (Bulter) | <i>Castanea crenata</i> Sieb. et Zucc. <i>Malus</i> spp. <i>Pyrus pyrifolia</i> (Brum.) var. <i>culta</i> Nakai <i>Prunus persica</i> Batsch <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Vigna angularis</i> (Willd.) Ohwi et Ohashi <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. <i>Camellia sinensis</i> (L.) <i>Aster ageratoides</i> Turcz. subsp. <i>ovatus</i> (Franch. et Savat.) <i>Chrysanthemum</i> spp. etc. | | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsu-shima, Tanega-shima, Yaku-shima) | 39, 46, 47 |
| <i>Nyssiodes lefuarius</i> (Erschoff) | <i>Rumex acetosa</i> L. <i>R. japonicus</i> Houtt. <i>Rosa multiflora</i> Thunb. <i>Chrysanthemum morifolium</i> Ram. <i>Pueraria lobata</i> (Willd.) Ohwi Leguminous plants etc. | | Japan (Hokkaido, Honshu, Kyushu), USSR, China | 13, 39 |
| Sphingidae | | | | |
| <i>Clanis bilineata tsingtaica</i> Mell | <i>Wistaria floribunda</i> (Willd.) DC. | Leaf | Japan (Honshu, Shikoku, Kyushu, USSR, China) | 13, 16, 39, 46 |

Table 1-a. (Continued)

| Species | Host plant ²⁾ | Plant part affected ³⁾ | Distribution ⁴⁾ | Reference ⁵⁾ |
|---|---|-----------------------------------|--|-------------------------|
| | <i>Robinia pseudo-acacia</i> L. <i>Lespedeza</i> spp. <i>Glycine max</i> Merrill <i>Pueraria lobata</i> (Willd.) Ohwi | | Tsu-shima, Yaku-shima, Okinawa), Korea, China | |
| Lymantriidae | | | | |
| * <i>Lymantria dispar japonica</i> (Motschulsky) | <i>Alnus hirsta</i> (Turcz.) <i>Castanea crenata</i> Sieb. et Zucc. <i>Malus</i> spp. <i>Rosa</i> spp. <i>Prunus</i> spp. <i>Pueraria lobata</i> (Willd.) Ohwi <i>Diospyros kaki</i> Thunb. etc. | Leaf | Japan (Honshu, Shikoku, Kyushu) | 13, 39, 46 |
| Arctiidae | | | | |
| <i>Thanatarctia imparilis</i> (Butler) | <i>Salix</i> spp. <i>Castanea crenata</i> Sieb. et Zucc. <i>Quercus serrata</i> Thunb. <i>Pyrus pyrifolia</i> (Burm.) var. <i>culta</i> Nakai <i>Prunus persica</i> Batsch <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Tsu-shima, Yaku-shima), Taiwan, China | 39, 46 |
| Noctuidae | | | | |
| <i>Heliothis maritima adaucta</i> Butler | <i>Pueraria lobata</i> (Willd.) Ohwi <i>Linum usitatissimum</i> L. Leguminous plants | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu) | 39, 46 |
| * <i>Mocis undata</i> (Fabricius) | <i>Cytisus scoparius</i> (L.) Link <i>Wistaria brachybotrys</i> Sieb. et Zucc. <i>Desmodium podocarpum</i> DC. <i>Pueraria lobata</i> (Willd.) Ohwi <i>Medicago deniculata</i> Willd. <i>Glycine max</i> Merrill <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | Japan (Honshu, Kyushu, Izu-oshima, Ryukyus), Taiwan, India, Australia, Oceanic Is. USA (Florida, Louisiana) | 39, 46, 57 |
| <i>Anticarsia gemmatilis</i> Hübner | <i>Medicago deniculata</i> Willd. <i>Glycine max</i> Merrill <i>Pueraria lobata</i> (Willd.) Ohwi | Leaf | USA (Florida, Louisiana) | 1, 3 |
| <i>Egryia apicalis</i> Guenée | <i>Wistaria brachybotrys</i> Sieb. et Zucc. | Leaf | Japan (Honshu, Shikoku, Kyushu, | 39, 57 |

| | | | | |
|--|--|------|---|--------------------|
| * <i>Microxyla confusa</i> (Wileman) | <i>Pueraria lobata</i> (Willd.) Ohwi Leguminous plants | Leaf | Tsu-shima, Yaku-shima, Ryukyus, India, S.E. Asia | 39, 57 |
| * <i>Paragabara flavomaculata</i> (Oberthür) | ** <i>Pueraria lobata</i> (Willd.) Ohwi Leguminous plants | Leaf | Japan (Honshu, Shikoku, Kyushu, Tsu-shima, Yaku-shima) | 68 Present data |
| II ARACHNOIDEA ACARINA Tetranychidae <i>Panonychus citri</i> (McGregor) | <i>Pyrus pyrifolia</i> (Brum.) var. <i>culta</i> Nakai <i>Eriobotrya japonica</i> Lindl. <i>Prunus persica</i> Batsch <i>Pueraria lobata</i> (Willd.) Ohwi <i>Poncirus trifoliata</i> (L.) <i>Citrus</i> spp. <i>Fortunella</i> spp. <i>Diospyros kaki</i> Thunb. Leguminous plants <i>Malus</i> spp. <i>Pyrus serotina</i> Rehder var. <i>culta</i> Nakai <i>Prunus persica</i> Batsch <i>Fragaria</i> spp. <i>Fortunella</i> spp. <i>Glycine max</i> Merrill <i>Pueraria lobata</i> (Willd.) Ohwi <i>Citrus</i> spp. <i>Vitis vinifera</i> L. <i>Camellia sinensis</i> (L.) D. Kuntze <i>Solanum melongena</i> L. <i>Cucumis melo</i> L. <i>Zea mays</i> L. <i>Oryza sativa</i> L. etc. | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu) | 2, 4 |
| * <i>Tetranychus kanzawai</i> Kishida | | Leaf | Japan (Hokkaido, Honshu, Shikoku, Kyushu, Okinawa) | 4, 59 |

Table 1-b. (Continued)

| Species | Food crops & vegetables | Fruit trees | Industrial crops | Ornamental plants & flowers | Forest trees | Other leguminous plants | Other plants | Biological dried-specimens |
|-------------------------------|------------------------------|-------------|------------------|-----------------------------|--------------|-------------------------|--------------|----------------------------|
| Thysanoptera | | | | | | | | |
| Thripidae | | | | | | | | |
| <i>Salpingothrips</i> | | | | | | | | |
| <i>aimotofus</i> | | | | | | | | |
| <i>Thrips coloratus</i> | | | | | | | | |
| <i>T. hawaiiensis</i> | | | | | | | | |
| <i>Megaleurothrips</i> | | | | | | | | |
| <i>distalis</i> | | | | | | | | |
| Coleoptera | | | | | | | | |
| Scarabaeidae | | | | | | | | |
| <i>Anomala cuprea</i> | | | | | | | | |
| <i>A. lucens</i> | | | | | | | | |
| <i>Blitopertha orientalis</i> | | | | | | | | |
| <i>Mimela splendens</i> | | | | | | | | |
| <i>Popillia japonica</i> | | | | | | | | |
| Buprestidae | | | | | | | | |
| <i>Trachys auricollis</i> | | | | | | | | |
| <i>T. reitteri</i> | | | | | | | | |
| Dermestidae | | | | | | | | |
| <i>Anthrenus verbasci</i> | | | | | | | | |
| Nitidulidae | | | | | | | | |
| <i>Haptoncurina paulula</i> | | | | | | | | |
| Cerambycidae | | | | | | | | |
| <i>Falsomesosella</i> | | | | | | | | |
| <i>gracilior</i> | | | | | | | | |
| <i>Mesosa longipennis</i> | | | | | | | | |
| <i>M. myops myops</i> | | | | | | | | |
| <i>Atimura japonica</i> | | | | | | | | |
| <i>Mesosella simiola</i> | | | | | | | | |
| <i>Pterolophia annulata</i> | | | | | | | | |
| <i>P. caudata caudata</i> | | | | | | | | |
| <i>P. zonata</i> | | | | | | | | |
| | Soybean | | | | | | | |
| | Kidney bean | | | | | | | |
| | Adzuki bean | | | | | | | |
| | Cowpea | | | | | | | |
| | Garden pea | | | | | | | |
| | Broad bean | | | | | | | |
| | Peanut | | | | | | | |
| | Rice | | | | | | | |
| | Wheat | | | | | | | |
| | Miller | | | | | | | |
| | Maize | | | | | | | |
| | Potato | | | | | | | |
| | Sweet potato | | | | | | | |
| | Eggplant | | | | | | | |
| | Cucumber, melon etc. | | | | | | | |
| | Radish, <i>Brassica</i> spp. | | | | | | | |
| | Asparagus | | | | | | | |
| | Strawberry | | | | | | | |
| | Citrus | | | | | | | |
| | Japanese persimmon | | | | | | | |
| | Apple | | | | | | | |
| | Pear | | | | | | | |
| | Peach, plum & apricot | | | | | | | |
| | Cherry | | | | | | | |
| | Grape | | | | | | | |
| | Fig | | | | | | | |
| | Chestnut | | | | | | | |
| | Mulberry | | | | | | | |
| | Tobacco | | | | | | | |
| | Tea | | | | | | | |
| | Sugarcane | | | | | | | |
| | Sesame | | | | | | | |
| | Chrysanthemum | | | | | | | |
| | Dahlia | | | | | | | |
| | Gladiolus | | | | | | | |
| | Rose | | | | | | | |
| | Cherry | | | | | | | |
| | Wisteria | | | | | | | |
| | Maple | | | | | | | |
| | Fir, spruces & pine | | | | | | | |
| | Walnut | | | | | | | |
| | Alder | | | | | | | |
| | Oak | | | | | | | |
| | Japanese Zelkova | | | | | | | |
| | Bamboo & bamboograss | | | | | | | |
| | Other leguminous plants | | | | | | | |
| | Other plants | | | | | | | |
| | Biological dried-specimens | | | | | | | |

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