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MISTLETOE (*VISCUM ALBUM* L.) AT THE KÓRNIK ARBORETUM

(Jemiola pospolita (*Viscum album* L.) w Arboretum Kórnickim)

Introduction

Mistletoe (*Viscum album*) is one of the scarce plant semiparasites found on trees and broad-leaved bushes of Europe. In 1906, C. Tubeuf [16] worked out the geographical distribution of mistletoe. The area of its natural occurrence covers nearly all of Europe, part of Asia and presumably Northern Africa. The south border of the area of occurrence runs along the shores of the Mediterranean and Black Seas as far as Caucasus, while the north border extends over Spain, Portugal, the British Isles, the southern part of Norway, central Sweden, the USSR (Lithuania, White Russia and Ukraine).

In Poland, mistletoe is encountered in greater or lesser numbers all over the country. After H. Karmazyńska [7], in the eastern parts of Poland mistletoe is usually found on *Betula verrucosa*; in the southern regions (Silesia, Little Poland) — on *Tilia cordata*; while in the north (Great Poland, Pomerania) on poplar trees. Other species of mistletoe occur in Poland also on conifers: *Viscum laxum* Boiss. on pine and *Viscum abietis* Beck. on fir.

In the vicinity of Kórnik, mistletoe occurs with great intensity. It has infested in particular trees growing all along groove lakes extending from Kórnik as far as Zaniemyśl. On the Bnińskie Lake, mistletoe was noticed on a common pine.

The Kórnik Arboretum comprises about 2500 species and varieties of European, Asiatic and American trees and shrubs. For this reason, being a semiparasite of broad-leaved trees and shrubs, *Viscum album* enjoys wide opportunities of selecting a host among trees of foreign origin.

When materials were collected for the present study (winters 1965–66 and 1966–67) the author noticed mistletoe on several hosts which had not been recorded in the literature.

Bibliographical Review

In 1906, C. Tubeuf [16] provided a list of genera of trees and shrubs harboring common mistletoe: *Populus*, *Salix*, *Juglans*, *Betula*, *Corylus*, *Carpinus*, *Castanea*, *Quercus*, *Fagus*, *Crataegus*, *Pirus*, *Malus* (more frequently on apple than on pear), *Sorbus*, *Prunus*, *Rosa*, *Robinia*, *Caragana*, *Acer*, *Aesculus*, *Tilia*. Further are mentioned *Quercus palustris*, *Q. rubra* and *Fagus grandifolia*, as trees of foreign origin infested with mistletoe. These data pertain to Western Europe, in the first place to Germany. H. Karmazyńska's paper [7] issued in 1928, in which are given several tree species parasitized by mistletoe, represents one of the more outstanding publications on the occurrence of mistletoe in Poland of the interwar period. Unfortunately, the scientific value of this issue is lessened by inaccuracies in source materials based on questionnaires of which the author made use.

In 1930, S. Makowiecki [8] published his own observations of *Viscum album*. Some of Karmazyńska's notions find support, while *Populus bolleana*, *Acer campestre*, *Aesculus octandra* and *Padus avium* are recorded as still other hosts of mistletoe. Makowiecki's study refers to the environs of Lvov.

J. Mądalski [9] made in 1938 some critical assertions on Karmazyńska's work on account of its inaccuracies, mentioning *Acer tataricum* and *Aesculus carnea* as new Polish hosts of mistletoe.

The list of vascular plants of Great Poland, compiled by J. W. Szulczewski [14] and based on F. Pfuhl's paper issued in 1896, comprises some further hosts of mistletoe, such as *Alnus glutinosa*, *A. incana* and *Sorbus aria*.

Common mistletoe was reported to be seen on *Quercus palustris* and *Q. borealis*, at Brynek by H. Eder [6]. The underlying cause of mistletoe's parasitizing oaks of a foreign derivation, while local oak trees remain free from it, has so far not been explained.

In his description of *Viscum laxum* on trunks of common pine, W. Szczerbiński [13] points out the widespread belief that distribution of mistletoe seeds is done nearly exclusively by birds. The absence of common mistletoe on *Populus nigra* 'Italica' is accounted for, by this author, by the inaccessibility to birds of the near vertical branches of this species. However, this explanation does not seem plausible. The arrangement of branches of this poplar does not prevent birds from settling on them; it is only a matter of the lesser adherence of mistletoe seeds deposited on the almost erect twigs.

R. Olaczek [11] worked out a list of localities of *Viscum album* in the Łódź District. In this publication, Euro-American poplar hybrids, mentioned under the common name *Populus euramericana*, are included in the register of mistletoe hosts.

In the monograph on mistletoe ecology in the Białowieża Forest by A. W. Sokołowski and J. B. Faliński [12] there have been mentioned hitherto unknown

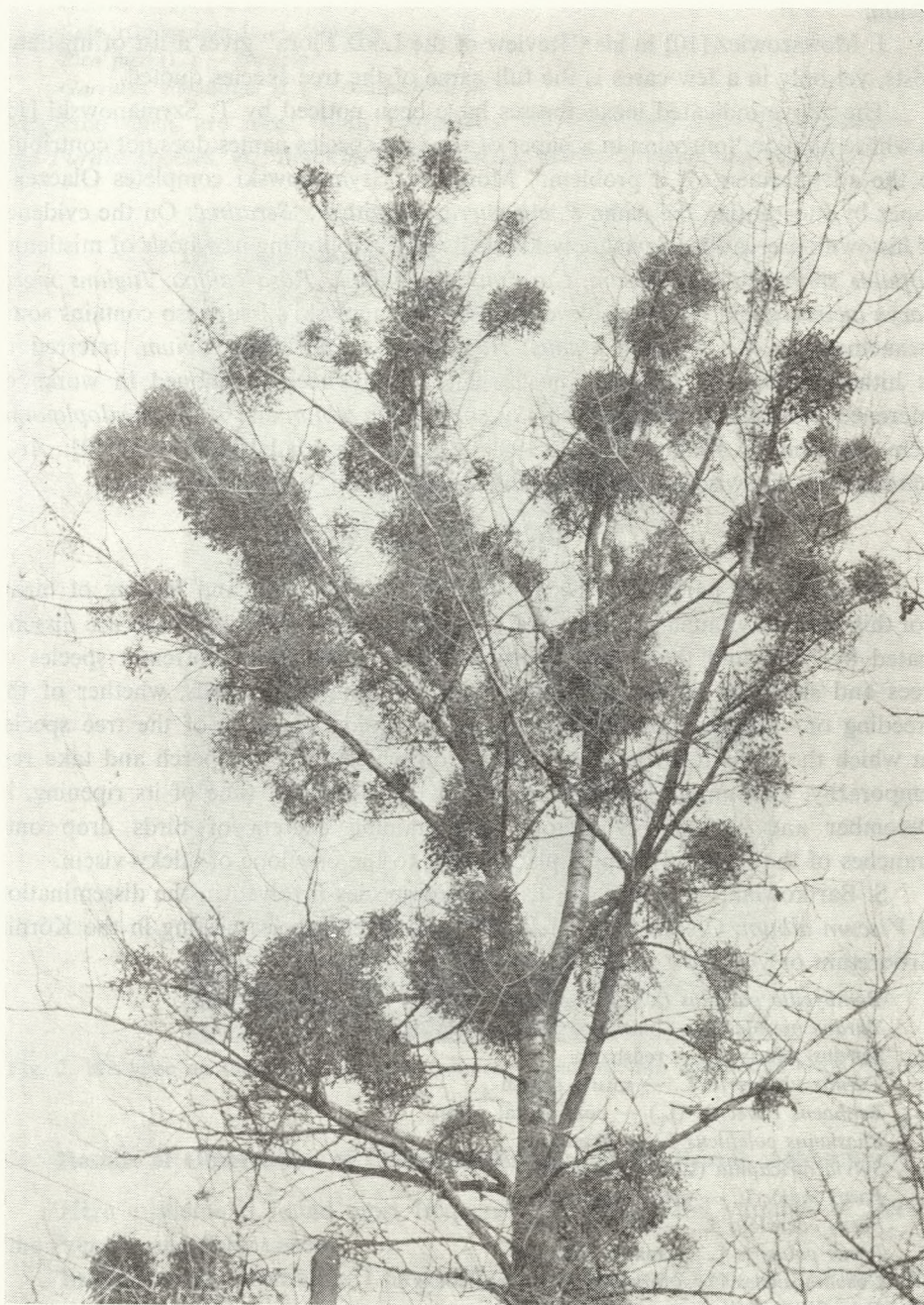


Fig. 1. Mistletoe in the crown of *Populus 'Marilandica'*. Kórnik Arboretum, Nov. 17, 1960.
Photo by K. Jakusz:

mistletoe hosts, in the first place a few species and hybrids of willow and *Cerasus avium*.

J. Mowszowicz [10] in his "Review of the Łódź Flora" gives a list of mistletoe hosts, yet only in a few cases is the full name of the tree species quoted.

The above indicated inexactnesses have been noticed by T. Szymanowski [15] in whose opinion "omission in a paper of relevant species names does not contribute to the advancement of a problem." Moreover, Szymanowski completes Olaczek's paper by substituting the name *P. euramericana* with *P. 'Serotina'*. On the evidence of his own observations Szymanowski has listed the following new hosts of mistletoe: *Populus simonii*, *Acer rubrum*, *Carpinus caroliniana*, *Rosa canina*, *Juglans nigra*, *Carya laciniosa* and *C. ovata*. Nevertheless, Szymanowski's issue also contains some inexactnesses: *Acer pseudoplatanus*, *A. tataricum* and *Padus avium*, referred to as hitherto unknown mistletoe hosts, had already been mentioned in works of reference on mistletoe for forty years or so. *Viscum album* and *Acer pseudoplatanus* were reported by Makowiecki in 1930 [8], and by Mađalski in 1938 [9]; *Acer tataricum* — likewise by Mađalski and *Padus avium* — by Makowiecki.

Role of Birds

Arboreta and parks afford ideal conditions for nesting and feeding of birds. For this reason avifauna of such terrains is abundant. Seeds of mistletoe are disseminated by birds and therefore expansion of this species onto different species of trees and shrubs is closely associated with the number of birds, whether of the breeding or visitant kind. Mistletoe takes possession not only of the tree species on which the birds feed but also of those on which the birds perch and take rest temporarily. Consumption of mistletoe fruit takes place at time of its ripening, in December and January. Mistletoe-seed-containing excreta of birds drop onto branches of the tree and keep in place owing to the envelope of sticky viscin.

S. Bartkowiak [1] prepared a list of bird species involved in the dissemination of *Viscum album*. On the basis of this list are given species nesting in the Kórnik Arboretum or visiting it in wintertime:

- Bombycilla garrulus* (L.) — waxwing
- Turdus merula* L. — blackbird
- Turdus pilaris* L. — redshank
- Turdus viscivorus* L. — mistle thrush
- Erithacus rubecula* (L.) — continental robin
- Phasianus colchicus* L. — pheasant
- Sylvia atricapilla* (L.) — blackcap
- Parus major* L. — great titmouse
- Parus coeruleus* L. — blue titmouse
- Parus palustris* L. — marsh titmouse
- Coccothraustes coccothraustes* L. — grossbeak
- Fringilla coelebs* L. — chaffinch
- Passer montanus* (L.) — hedgesparrow
- Emberiza citrinella* L. — yellow hammer

Sturnus vulgaris L. — starling
Corvus frugilegus L. — rook
Caleus monedula L. — jackdaw
Pica pica (L.) — magpie
Garrulus glandarius (L.) — continental jay

Mistletoe seeds are most often propagated by waxwings and representatives of the *Turdus* species, viz. blackbirds, redshanks, mistle thrushes and thrushes.

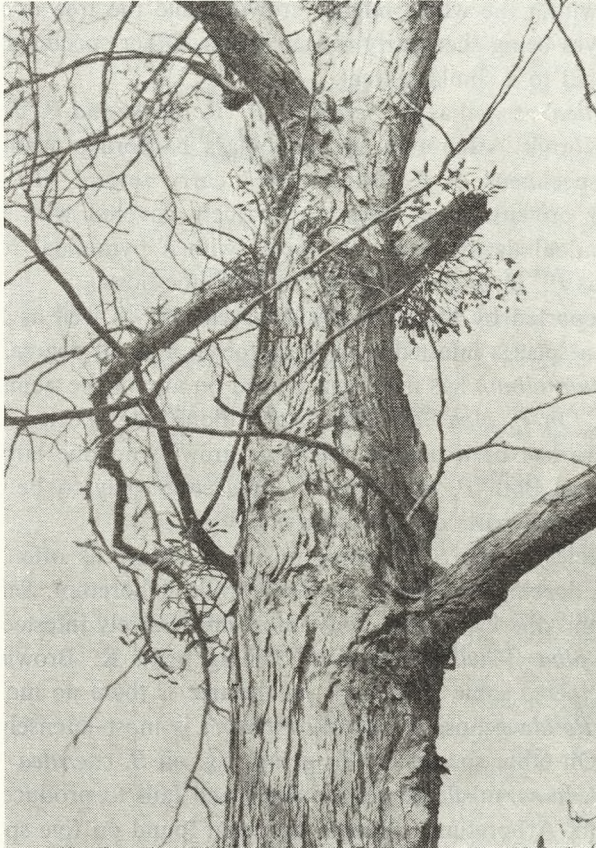


Fig. 2. Mistletoe on the trunk of *Carya laciniosa* Loud. Kórnik Arboretum, Nov. 17, 1960.
Photo by K. Jakusz.

Results of Observation of Common Mistletoe in the Kórnik Arboretum*

Here mistletoe is found most frequently on species and varieties of trees of the *Populus* and *Salix* genera.

In the Kórnik Arboretum I have only seen a few specimens of mistletoe, har-

*A full list of species and varieties of trees and shrubs infested by mistletoe is given in the further part of this work.

bored by two *Populus nigra* trees more or less a century old. Though in the opinion of most authors mistletoe is in principle a parasite of black poplar, in actual fact this species is the common host of mistletoe only in some particular regions of the country.

Populus 'Serotina' pointed out by Szymanowski is one of the species most frequently parasitized by mistletoe. In the Kórnik Arboretum a hundred-year-old specimen of this poplar is completely infested with mistletoe. Clusters of mistletoe are set densely within the whole mighty crown, while the tree is evidently fading out, its poor leaves being shed early in the season. Other specimens of this poplar species are infested to a similar extent.

P. 'Marilandica' as well as *P. 'Serotina'*, *P. 'Robusta'* and *P. 'Regenerata'* have proved in the Kórnik Arboretum to be poplars harboring mistletoe to a great extent. A few specimens of *P. 'Marilandica'* carry several dozens of mistletoe bunches in their crowns, these trees are scarcely covered with leaves, showing symptoms of gradual decay. Also the poplar with a pyramidal form, designated by Wróblewski as *P. 'Hybrida I'* belongs to mistletoe hosts.

P. alba is reported by Mądalski [9]; Olaczek [11] as well as Sokołowski and Faliński [12] as a species infested with mistletoe to a small degree. At the Kórnik Arboretum, *Viscum album* has not been noticed on any of the numerous specimens of white poplar. On *P. alba* var. *angustifolia* alone, the species distinguished by Wróblewski, there has been noticed mistletoe growing in one large clump and a few small bunches. Both *P. alba* and *P. nigra* seem only to be greatly infested with mistletoe in some parts of the country.

On tree species of the *Salix* genus mistletoe occurs as often as on poplars, building up well developed clusters. In the Kórnik Arboretum, *Salix lucida* introduced from North America, proved to be most impressively infested with mistletoe, *S. alba* and *S. alba 'Vitellina pendula'* coming next. K. Browicz also noticed mistletoe on *S. cinerea* some years ago, yet the tree is there no more.

Within the *Betula* genus, *B. maximowicziana* is most intensely parasitized by *Viscum album*. On other species of this genus, e.g. on *B. coerulea 'Grandidentata'*, *B. japonica* or *B. lutea*, mistletoe occurs singly and fails to produce lush growth.

In the Kórnik Arboretum mistletoe has been found on five species of walnut, viz. on *Juglans cinerea*, *J. nigra*, *J. rupestris*, *J. Sieboldiana*, *J. Pittuensis*. Until the present, mistletoe has only been known on *J. cinerea* and *J. nigra*. Infestation was strongest on *J. nigra*, while less intensive on *J. cinerea* and *J. sieboldiana*.

Viscum album occurs likewise on trees of the *Carya* genus. It has been noticed on *C. ovata*, *C. cordiformis* and *C. laciniosa* — *C. cordiformis* representing in Poland a new host of mistletoe.

Mistletoe has been recorded on several species and varieties of apple, in particular in collections of this genus. Infestation with *Viscum album* of apple trees can be accounted for by the frequent visiting of the trees by birds in winter (the time of ripening of mistletoe); partly frozen fruit represent inviting food for the birds.

Table 1

Species and Varieties of Trees and Shrubs Growing in the Kórnik Arboretum
on Which *Viscum album* L. Occurs

Intensively	Occasionally	Scarcely
<i>Acer platanoides</i> L. <i>A. saccharinum</i> L.	<i>Acer saccharinum</i> L. 'Wieri'* <i>Betula maximowicziana</i> Reg.*	<i>Acer pseudoplatanus</i> L. <i>Aesculus neglecta</i> var. <i>lanceolata</i> Sarg.* <i>Aesculus octandra</i> Marsh. <i>Alnus glutinosa</i> Gaertn. <i>Betula coerulea</i> Blanchard. 'Grandidentata'* <i>B. japonica</i> Miq.* <i>B. lutea</i> Michx.* <i>Carya cordiformis</i> K. Koch.* <i>C. ovata</i> K. Koch. <i>Corylus avellana</i> L. + <i>Crataegomespilus</i> sp.* <i>Fraxinus americana</i> L.* <i>F. chinensis</i> Roxb. var. <i>rchyncho-</i> <i>phylla</i> Hemsl.* <i>F. excelsior</i> L. <i>F. excelsior</i> L. var. <i>lutea</i> Loud.* <i>Juglans cinerea</i> L. <i>J. nigra</i> L. <i>J. Pittuversii</i> Moor.* <i>J. rupestris</i> Engelm.* <i>J. Sieboldiana</i> Maxim.* <i>Malus baccata</i> Borkh.* <i>M. baccata</i> Borkh. var. <i>Jackii</i> Rehd.* <i>M. fusca</i> Schn.* <i>M. hupenheis</i> Rehd.* <i>M. × prunifolia</i> Borkh.* <i>M. purpurea</i> 'Hoser', 'Makowiec-ki', 'Szafer', 'Wierdak'* <i>M. Scheideckeri</i> Zab. 'Pendula'* <i>M. spectabilis</i> Borkh.* <i>M. torignoides</i> Hughes.* <i>M. × Zumi</i> var. <i>colocarpa</i> Rehd.* <i>Populus angulata</i> Ait.* <i>P. angulata</i> 'Cordata'* <i>P. alba</i> L. var. <i>angustifolia</i> Wróbl.* <i>P. × canescens</i> Sm.* <i>P. × hybrida</i> 275* <i>P. koreana</i> Rehd.* <i>P. laurifolia</i> Ldb.* <i>P. Maximowiczii</i> Henry* <i>P. nigra</i> L. <i>P. 'Sarcé rouge'</i> * <i>P. Wilsonii</i> Schn.* <i>Padus avium</i> Mill. <i>Pirus Calleryana</i> Decne* <i>P. serotina</i> Rehd.* <i>Robinia pseudoacacia</i> L. var. <i>pentaphylla</i> Wróbl. <i>Salix cinerea</i> L. <i>Sorbus americana</i> Marsh.* <i>S. sambucifolia</i> Roem.* <i>Tilia cordata</i> Mill. 'Pyramidalis'* <i>T. glabra</i> 'Columnaris'* <i>T. tomentosa</i> Moench.
<i>Fraxinus pennsylvanica</i> Marsh.	<i>Carya laciniata</i> Loud.	
<i>Populus</i> 'Grandis'*	<i>Malus purpurea</i> Rehd.*	
<i>P.</i> 'Hybrida I'*	<i>Populus × berolinensis</i> Dipp.	
<i>P.</i> 'Marilandica'*	<i>P.</i> 'Gelrica'*	
<i>P.</i> 'Regenerata'*	<i>P. rogalinensis</i> Wróbl.*	
<i>P.</i> 'Robusta'*	<i>P. Simonii</i> Carr.	
<i>P.</i> 'Serotina'	<i>P. tremuloides</i> Michx.*	
<i>Salix alba</i> L.	<i>P. × Wobstii</i> Schred.*	
<i>S. lucida</i> Muhlenb.*	<i>Robinia pseudoacacia</i> L.	
	<i>Salix alba</i> L. 'Vitellina pen-	
	dula'*	
	<i>Tilia cordata</i> Mill.	
	<i>T. platyphyllos</i> Scop.	

*Mistletoe hosts not reported as such earlier.



Fig. 3. Mistletoe on a branch of *Malus spectabilis* Borkh. Kórnik Arboretum, Nov. 17, 1960
Photo by K. Jakusz.

In respect of pear trees, mistletoe has until now been recorded only on *Pyrus communis*. However, in the Kórnik Arboretum *Viscum album* was seen by the author on *P. serotina* and *P. calleryana* — always in the form of dwarf bushes. It can therefore be assumed that mistletoe rarely infests pear trees because of the unfavorable conditions of growth which they afford.



Fig. 4. Mistletoe in the crown of *Populus* 'Hybrida I'. On the left: crown of *P. Simonii* Carr. Kórnik Arboretum, March 10, 1967. Photo by T. Bojarczuk.

Until now, within the *Fraxinus* genus mistletoe has been known to infest *F. excelsior* and *F. pennsylvanica*. In the Kórnik Arboretum, *Viscum album* parasitizes the two mentioned species of *Fraxinus* and also *F. americana*, *F. excelsior* var. *lutea*, *F. chinensis* var. *rhynchophylla*. Mistletoe was most lush on *F. pennsylvanica*.

Of the *Acer* genus, *A. platanoides* was the most important host of mistletoe. In the Kórnik Arboretum mistletoe infests numerous specimens of this species, as well as *A. saccharinum* and *A. saccharinum* 'Wieri'. Just a single, unobtrusive cluster of mistletoe was noticed on *Acer pseudoplatanus*.

Karmazyńska [7] includes *Aesculus hippocastanum* in a group of trees harbor-



Fig. 5. Mistletoe in the crown of *Salix lucida* Muhlenb. Kórnik Arboretum, Feb. 15, 1967.
Photo by T. Bojarczuk.

ing mistletoe, at the same time putting in doubt the source of information, Szymanski [15] supports this view. Reliable information missing, it should be assumed that *A. hippocastanum*, horse chestnut, is not a host of *Viscum album*. Other species of this genus are well known to be infested with mistletoe. Makowiecki [8] has seen *Viscum album* on *Aesculus octandra*, while Mądalski [9] — on *A. rubi-*

cunda. In the Kórnik Arboretum mistletoe occurs on two species of the *Aesculus* genus, viz. on *A. octandra* and *A. neglecta* var. *lanceolata*. Numerous specimens of *A. hippocastanum* are free from mistletoe.

In the Kórnik Arboretum the author has not found mistletoe on *Celtis occidentalis*, though at the Botanical Garden of Wrocław *Viscum album* is known to parasitize this species, which represents the only host of the *Ulmaceae* family, so far not reported in the literature.

Conclusions

(1) In the Kórnik Arboretum, *Viscum album* occurs on 76 species and varieties of trees and shrubs belonging to 17 genera of 9 families. Of these 76 hosts of mistletoe, 54 have so far not been recorded in Poland in this role. On grounds of data on mistletoe hosts in works of reference and of the observations carried out at the Kórnik Arboretum, *Viscum album* has been stated to parasitize in Poland about 118 species and varieties of trees and shrubs belonging to 22 genera of 11 families.

(2) Common mistletoe occurs most often on species and varieties of poplar, within four sections: *Aigeiros*, *Leuce*, *Tacamahaca* and *Leucoides*. Infestation is strongest of poplars of the *Aigeiros* section, in particular on Euro-American hybrids. Mistletoe is rarely encountered on aromatic and large-leaved poplars.

(3) *Viscum album* infests in the same manner softwood tree species (*Populus*, *Salix*, *Tilia*) and hardwood species (*Carpinus*, *Pyrus*, *Celtis*). Mistletoe of the softwood hosts has a healthy appearance, large leaves and more impressive external form than the corresponding parasites of hardwood hosts.

(4) The greater or lesser intensity of occurrence of *Viscum album* in different parts of the country is dependent on the autumn and winter migrations of birds.

(5) It seems highly probable that in Poland the occurrence of mistletoe on various species of trees is peculiar to the given regions.

(6) To all appearance, *Viscum album* occurs in Poland on still other species and varieties of trees and shrubs, especially on these of foreign origin, growing in parks, botanical gardens and arboreta.

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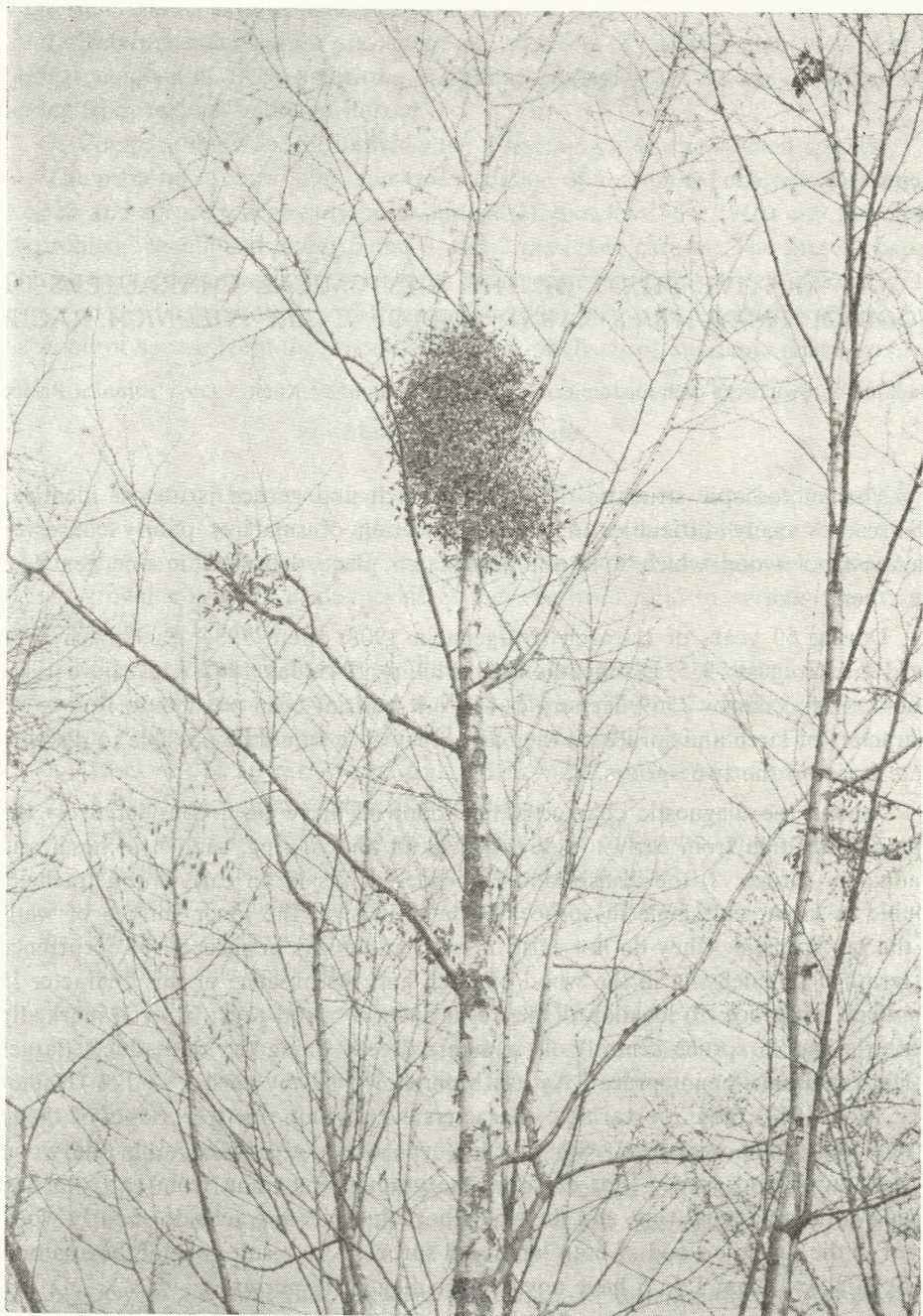
SUMMARY

The author presents results of observations on the occurrence of mistletoe in the Kórnik Arboretum. In the Arboretum *Viscum album* has attacked 76 species and varieties of trees and shrubs belonging to 17 genera and 9 families. Out of these, 54 species and varieties have not been reported so far as hosts for mistletoe.

The author has found that mistletoe occurs most commonly on species and varieties of trees from the genus *Populus*. Poplars from section *Aigeiros* are attacked most, particularly the euroamerican hybrids. On the Balsam and broad-leaved poplars mistletoe occurs rarely.

Mistletoe occurs both on tree species with soft wood (*Populus*, *Salix*, *Tilia*) and on species with hard wood (*Carpinus*, *Pirus*, *Celtis*).

Seeds of mistletoe are distributed by birds, whose autumn and winter migrations are responsible for the spread of the seed over considerable distances.



Mistletoe in the crown of *Betula maximowicziana* Reg. Kórnik Aboretum. Photo by K. Jakusz.