

UDC: 578.4:582.635.38

CARLAVIRUS COMPLEX: DIAGNOSTIC SPECIES

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Keywords: *Hop mosaic virus, Hop latent virus, American hop latent virus, Humulus lupulus.*

The common hop (*Humulus lupulus* L.) is an industrial crop, also used as a medicinal plant [1]. Viral diseases reduce the yield of it. Identification of the virus plays a crucial role in viral disease prevention and control. Modern virus identification methods can only confirm the affiliation of a specific virus with a predicted taxon and can't recognize the virus of the unexpected taxon. Given the above, the determination of all viruses that can infect a particular host species is necessary for successful identification of the virus and consequently for effective viral disease prevention and control [2].

Numerous viruses infecting hop were reported over the last century. However, as some of these viruses and antisera for them were lost forever, and their nucleotide sequence data were absent, they can't be re-identified. As a result, only 15 identifiable virus species infecting *H. lupulus* are currently known. Three of them, American hop latent virus (AHLV), Hop latent virus (HLV), and Hop mosaic virus (HMV), together known as *Carlavirus complex*, have a filamentous virion longer than 500 nm. The *Carlavirus complex* is distinguished from other identifiable viruses by these morphological characteristics [2]. Nevertheless, many researchers in Ukraine and some other countries have discovered other unidentifiable viruses infecting hop, sharing morphological characteristics with the *Carlavirus complex*. These viruses, in particular, include the agent of infectious chlorosomosaic disease of hops, hop leaf-roll virus, and hop infectious sterility virus [3-5]. This fact leads to the necessity of finding additional criteria for distinguishing both identifiable and unidentifiable filamentous viruses infecting *H. lupulus*. One such criterion could be the response of diagnostic species to viral infection, as inoculation of diagnostic species with the virus is one of the oldest and most widely used techniques for virus identification. Therefore, the research aimed to select diagnostic species with well-studied responses to inoculation with each member of the *Carlavirus complex*. To this end, the authors compared the research results on host ranges of HMV, HLV, and AHLV [6-10].

The various isolates of HMV, HLV, and AHLV in the compared studies were identified serologically using an antiserum prepared by Dr. A. N. Adams and col-

leagues [6-10]. The current binomens of hosts were indicated according to The World Flora Online (WFO) Plant List.

Diagnostic species were selected based on the following criteria: uniform responses to inoculation with different isolates of the same virus species; known response to inoculation with each member of the *Carlavirus complex*. As a result of the selection, the authors identified 12 diagnostic species listed in the Table 1.

Table 1. – Diagnostic species of the *Carlavirus complex*

Host binomen	HMOV			HLV			AHLV		
	I	S	R	I	S	R	I	S	R
<i>Alkekengi officinarum</i> Moench	N	—	9	N	—	6	L	0	6
<i>Allium cepa</i> L.	N	—	9	N	—	6	N	—	6
<i>Cucumis sativus</i> L.	N	—	8-10	N	—	6-8	G	0	6
<i>Cucurbita pepo</i> L.	N	—	8	N	—	6, 8	L	0	6
<i>Datura stramonium</i> L.	N	—	8, 10	N	—	6-8	L	+	6
<i>Gomphrena globosa</i> L.	N	—	8-10	N	—	6-8	N	—	6
<i>Lathyrus oleraceus</i> Lam.	L	?	9	N	—	6	N	—	6
<i>Nicotiana glutinosa</i> L.	N	—	8	N	—	6-8	N	—	6
<i>Petunia hybrida</i> E.Vilm.	N	—	8, 9	N	—	6, 8	N	—	6
<i>Raphanus raphanistrum</i> subsp. <i>sativus</i> (L.) Domin	N	—	10	N	—	6	N	—	6
<i>Solanum lycopersicum</i> L.	N	—	10	N	—	6, 7	N	—	6
<i>Vicia faba</i> L.	N	—	8-10	N	—	6, 8	L	0	6

Notes: I, infection type; S, symptoms; R, references; N, not infected; L, local infection; G, systemic infection; +, necrotic spots and / or ringspots; 0, symptomless infection; ?, symptoms unknown.

In conclusion, the authors selected 12 diagnostic species or subspecies of the *Carlavirus complex*. HMOV, HLV, and AHLV do not infect 6 of them, namely *A. cepa*, *G. globosa*, *N. glutinosa*, *P. hybrida*, *R. raphanistrum sativus*, and *S. lycopersicum*. HMOV infect only *L. oleraceus*. HLV does not infect any of these diagnostic species. AHLV infect *A. officinarum*, *C. sativus*, *C. pepo*, *D. stramonium*, and *V. faba*. These data can be utilized in future research to classify unidentifiable filamentous viruses infecting *H. lupulus*, and to identify HMOV, HLV, and AHLV.

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УДК: 615.322:582.711.712-116.5.085.2

ОСОБЛИВОСТІ КЛОНАЛЬНОГО МІКРОРОЗМНОЖЕННЯ

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Ключові слова: *Rosa canina*, клональне мікророзмноження, *in vitro*, ризогенез, регулятори росту.

Шипшина собача (*Rosa canina* L.) належить до вітаміновмісної лікарської рослинної субстанції і цінується як джерело вітаміну С, мінералів, флавоноїдів та інших біоактивних сполук і є дуже перспективним джерелом природних фенольних антиоксидантів, з високим вмістом еллагової кислоти, кемпферолу тощо. М'якоть плодів шипшин містить провітамін А, вітаміни В₂, Р і К, а насіння – вітамін Є [1]. Плоди шипшини використовуються в натуральному та висушеному вигляді. У фармації з плодів та насіння готують різні вітамінні препарати: холосас, каротілін, шипшинову олію тощо.

Традиційно більшість сортів виду *Rosa canina* розмножують вегетативним способом, але цей процес повільний та трудомісткий. З іншого боку, клональне розмноження має кілька ґрунтовних переваг порівняно з традиційним методом розмноження, а саме: мультиплікується матеріал з бажаними показниками, що надзвичайно важливо з огляду на фармацевтичну цінність *R. canina*,