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## Original article

## Interception of weevils on cut flowers from South Africa by Korea plant quarantine

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## ABSTRACT

In 2015, a total of 31 samples belonging to superfamily Curculionoidea (Coleoptera) were intercepted from the cut flowers imported from South Africa at the Korean quarantine border. These samples were identified based on the available literature, and they were confirmed as 11 species belonging to four families. However, only three species were identified at the species level. The others were only classified into seven genera and one tribe level. Until now, there have been very few studies about weevils distributed in Africa. Consequently, there is a lack of available information for species identification of intercepted weevils at the quarantine border. This study aims to raise public awareness regarding the introduction of unwanted insect pests from the international trade of plants and/or plant products. It also suggests the need for international cooperation and taxonomic networking for the identification of intercepted pests.

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## Introduction

The superfamily Curculionoidea, generally known as “weevils,” is one of the largest insect groups and includes more than 60,000 species around the world. Most weevils feed on several kinds of plants (living, withered, or decomposed) according to their life stages, and damage several parts of plants such as root, stem, tree trunk, leaf, bud, flowers, and fruits. Currently, this group includes important agricultural insect pests. So, it is considered one of the significant taxonomic groups worldwide in the phytosanitary field.

Nowadays, as transportation systems are being rapidly developed, the volume of international trade activities between countries has continuously increased around the world. Currently, the importation of plants and/or plant products including cut flowers from numerous countries into Korea has substantially increased (Lee et al 2016). Likewise, the annual invasion rate and pest interceptions from imported cut flowers, planting materials, and/or vegetables have rapidly increased in Korea (Hong et al 2012).

In particular, as long as African countries, which account for 8% of exported cut flowers worldwide (Areal et al 2008), continue to

emerge as major suppliers of cut flowers in the Korean market, the introduction risk of unknown insects would be high (Table 1). These insects could be harmful to agriculture, horticulture, and forests in Korea. However, we do not have sufficient information about the biology and/or taxonomy of these insects because very few research studies have been performed in African countries.

Therefore, we tried to identify the intercepted weevils from cut flowers imported from the Republic of South Africa at the Korean quarantine border. However, currently available literatures were still not supportive for species identification. Based on these results, we discussed the introduction risk of unwanted insect pests from the international trade of plants and/or plant products, in terms of intercepted weevils from South African cut flowers. We also raised the need for international cooperation and taxonomic networking for the identification of intercepted pests.

## Materials and methods

A total 31 weevil samples were intercepted from cut flowers (*Berzelia* sp., *Brumia* sp., *Erica* sp., *Leucadendron* sp., etc.) imported from South Africa at the Korean quarantine border (Incheon International Airport) in 2015. They were classified into family and subfamily based on Alonso-Zarazaga and Lyal (1999). The plates (including dorsal and side images) and illustrations for each species

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**Table 1.** Inspection number of imported consignment of cut flowers from African countries to South Korea.

Country	Amount of cut flowers imported by year															
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Cameroon	–	–	–	–	–	–	–	–	–	–	–	–	6	–	–	–
Ethiopia	–	–	–	–	–	–	1	–	–	–	–	3	2	18	43	44
Kenya	–	–	–	–	–	–	1	1	–	6	1	15	109	245	197	142
Mauritius	3	2	1	–	–	–	–	–	–	–	–	–	–	–	–	–
Nigeria	–	–	–	–	–	1	–	–	1	10	–	2	–	–	–	–
Republic of South Africa	–	8	31	14	28	41	35	32	88	22	92	139	295	437	1,072	1,749
Zimbabwe	–	1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Total	3	11	32	14	28	42	37	33	89	22	93	159	412	700	1,312	1,935

were taken using a digital camera (LEICA DFC2900) attached on Leica MZ APO stereoscope (Leica Microsystems, Wetzlar, Germany) and stacked using the Leica Application Suite Program (LAS Version 4.6.0; <http://www.leica-microsystems.com>).

## Results

A total of 31 samples in 24 interception cases were identified as 11 species belonging to four families, Apionidae, Curculionidae, Dryophthoridae, and Nanophyidae. Among the 11 species, only three species were identified at the species level. However, the others were classified only into seven genera and one tribe level.

List of weevils intercepted by Korean Plant Quarantine

### Family Apionidae

#### 1. ?*Chrysapion* sp. in a broad sense (Figure 1A)

**Diagnosis.** Body length 2.4–2.5 mm (excluded rostrum). Rostrum reddish brown, a third basal part attached with antennae darker than the rest part. Head, pronotum, and coxae and trochanters of legs dark reddish brown, and elytra and femur and tibiae of legs light reddish brown. Pronotum uniformly covered with bright yellow scales. A third posterior part of elytra densely covered with bright yellow round scales.

**Materials examined.** South Africa, 2 exs., 15. I. 2015 (No. 15063209-2) on cut flower (*Brunia albiflora*); 2 exs., 2. II. 2015 (No. 15130370-6) on cut flower (*Erica* sp.).

Family; Curculionidae.  
Subfamily; Ceutorhynchinae.

#### 2. *Micrelus* sp. 1 in a broad sense (Figure 1B)

**Diagnosis.** Body length 2.4 mm (excluded rostrum). Integument for the most part reddish brown. Antennal funiculus seven-segmented. Rostrum narrower than profemora. Pronotum clearly transverse with small acute lateral tubercles. Elytra rectangular, a little longer than wide. Base of elytra raised against that of prothorax and crenulated. All interspaces throughout their length with a series of erected narrowly elongate scales. Rostral channel deep only on prosternum, not extending onto mesosternum. Hind tibiae with very large mucro.

**Material examined.** South Africa, 1 ex., 22. VI. 2015 (No. 15340969-1) on cut flower (*Berzelia* sp.).

#### 3. *Micrelus* sp. 2 in a broad sense (Figure 1C)

**Diagnosis.** Body length 2.6 mm (excluded rostrum). Integument for the most part reddish brown. Antennal funiculus seven-

segmented. Rostrum narrower than profemora. Pronotum clearly transverse with small acute lateral tubercles. Elytra weakly narrowed toward apex. Base of elytra raised against that of prothorax and crenulated. All interspaces throughout their length with a series of erected narrowly elongate scales. Rostral channel deep only on prosternum, not extending onto mesosternum. Hind tibiae without mucro.

**Materials examined.** South Africa, 1 ex., 30. IX. 2015 (No. 15463416-1) on cut flower (*Berzelia* sp.); 1 ex., 10. VIII. 2015 (No. 15403923-1) on cut flower (*Berzelia* sp.).

#### 4. *Micrelus* sp. 3 in a broad sense (Figure 1D)

**Diagnosis.** Body length 1.4 mm (excluded rostrum). Integument for the most part reddish brown. Antennal funiculus seven-segmented. Rostrum narrower than profemora. Pronotum clearly transverse with small acute lateral tubercles. Elytra weakly narrowed toward apex. Base of elytra raised against that of prothorax and crenulated. Elytral investiture consisting of a series of erected narrowly elongate scales intermingled with oval scales. Rostral channel deep only on prosternum, not extending onto mesosternum. Hind tibiae without mucro.

**Material examined.** South Africa, 1 ex., 14. XII. 2015. (No. 15543819-1) on cut flower (*Phyllica* sp.).

#### 5. *Scobinoides dentatus* Colonnelli (Figure 1E)

**Diagnosis.** Body length 1.8 mm (excluded rostrum). Integument piceous. Antennal scape and first three funicular segments reddish-brown. Rostrum two times as long as pronotum. Pronotum straight at apical margin and bisinuate at base. Interspaces convex and with a series of rasp-like granules, minute toward sides and apex, and in the form of teeth on interspaces I–III, being those on interspace II very large and sharp. All these teeth bear a comma-like half lifted white scale.

**Material examined.** South Africa, 1 ex., 5. X. 2015 (No. 15468457-3) on mixed cut flower (Autumn purple: *Berzelia* sp., *Agathosma* sp., *Spatalla* sp., *Chondropetalum* sp.).

**Distribution.** South Africa, Zimbabwe (by Colonnelli 2007).

Subfamily Curculioninae

#### 6. *Sibinia bruchoides* Caldara (Figure 1F)

**Diagnosis.** Body length 1.4 mm (excluded rostrum). Rostrum in lateral view curved. Elytra mostly black, covered with scales similar in shape and size on both striae and interspaces. Legs mostly blackish. Sternum V in male without fovea and with hind margin broadly incised, pygidium very large. Interspaces convex and with a

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