

Research Article

Study on the Cultivar Classification Principle of Wintersweet in Agricultural Zone

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Abstract: This study divided cultivars of wintersweet in agricultural zone into 3 groups: Concolor Group, Intermedius Group, Patens Group; and the scientific name were argued in this study. Based on the analysis of the existing cultivar classification principle of wintersweet in agricultural zone, the necessary of cultivar classification principle of wintersweet in agricultural zone according to ICNCP were pointed out. The practicality and scientificity of the purple texture on the inner tepals as the primary classification standard were demonstrated. 'compliance with international norms, scientific, practical' as the classification principle, the dual classification system of 'cultivar group-cultivar' were carried out.

Keywords: Classification standard, cultivar classification principle, cultivar group, wintersweet in agricultural zone

INTRODUCTION

According to the "ICNCP", variety is defined as "for the sake of the unity, correctness and stability of the name of a variety, on the agricultural, forestry and horticultural purposes, the cultivated plants group with any kind of characteristics, such as morphology, physiology, cell, chemical and other aspects, which can still maintain the characteristics of this difference by sexual or asexual reproduction are regarded as varieties" (Guo *et al.*, 2004; Xiang and Zang, 2006). The purpose of the classification of flower varieties is to research the species and the origin, classification, nomenclature, cultivation history and geographical distribution of the flower varieties, so as to expand the application of landscape plants (Chen, 1993a; Zang *et al.*, 2002), improve the production of flowers and garden seedlings and provide theoretical basis for the rational utilization of flower germplasm resources (Chen, 1998).

In addition, the evolution of wintersweet in agricultural zone cultivars is carrying on in the four characters of "color", "flower type" and "inner tepals purple lines" and "flower diameter" at the same time. Chen Longqing examined the West Hubei, East Sichuan and other areas with a relatively concentrated wintersweet in agricultural zone resources and found that wild wintersweet in agricultural zones have both dog teeth wintersweet in agricultural zones and

Concolor wintersweet in agricultural zone; some flower types are half containing like chime, some are bell-shaped and some are bowl-shaped; some tepals are oval and some are lanceolate; inner tepals purple lines change from no to full purple and this phenomenon is very similar to the wintersweet in agricultural zone cultivation, so the evolution rules are not very obvious. It is now generally considered dogteeth type is more primitive *Chimonanthus*, because the majority of wild wintersweet in agricultural zone are dog teeth type, some varieties are often deteriorated as dog teeth type.

MATERIALS AND METHODS

The existing cultivar classification system of wintersweet in agricultural zone: wintersweet in agricultural zone is an ancient and primitive plant in the plant kingdom and is the speciality in China. It is one of the few winter flower plants with great landscape value, but its species application and development is far less than the sweet scented osmanthus, peony, plum and other flowers (Liu and Tang, 2004; Chen, 1993b). The chaos of the names and classification system of wintersweet in agricultural zone cultivars is not conducive to the identification of wintersweet in agricultural zone cultivars, (Wang, 1986) and brought great inconvenience to the production and application of wintersweet in agricultural zone. The existing classification system of wintersweet in agricultural zone

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cultivars mainly has the following main classification systems.

Zhao Tianbang from Henan Agricultural University of China (Yu, 1982; Zhao *et al.*, 1993) proposed the two-level classification criteria: According to the middle and outer tepal colors as the first-level classification standard, it is divided into wintersweet in agricultural zone cultivar group, white wintersweet in agricultural zone cultivar group, green wintersweet in agricultural zone cultivar group, purple wintersweet in agricultural zone cultivar group; according to the inner tepal purple lines as the second-level classification standard, it is divided into different types, such as a group of wintersweet in agricultural zone cultivars can be divided into 4 types: Form Praecox, Form Jinhong, Form Concolor, Form Varians and so on.

Chen Longqing from Huazhong Agricultural University of China (Chen *et al.*, 2004) proposed the third-level classification system of "3 varieties, 3 classes, 6 models": the first-level standard is divided into *Chimonanthus* species, bright-leaf *Chimonanthus* species and hybrids *Chimonanthus* species according to the type of species. The second-level standard is divided into the wintersweet in agricultural zone classes of small flowers, medium flowers and large flowers according to the sizes of the flowers. The third-level standard is divided into the forms of concolor, epistasy type and the patens form type according to the inner tepal purple lines.

Zhao *et al.* (2007) from Beijing Forestry University of China proposed to regard the color of the inner tepals as the first-level classification. The wintersweet in agricultural zone cultivars are divided into 3 categories of the pure heart, purple heart and green heart; according to the shape of the tepal, that is, the ratio of length to width as the second level classification, wintersweet in agricultural zones can be divided into different varieties.

In summary, the existing cultivar classification systems have two major differences, one is which character of the color of tepals, flower type, flower diameter and the color of inner tepal is a classification standard and the second is the problem how many levels the wintersweet in agricultural zone cultivars are divided into.

In accordance with the provisions of "ICNCP": "the cultivation of the plants has three grades, namely species, cultivar group and grafted chimera." The cultivar classification of foreign ornamental plants has the most use of 1 level, up to 2 levels (Sokal and Sneath, 1963; Clifed and Stephenson, 1975); and the Chinese classification of garden plants generally exists the complex multi-level classification system with generally 3 to 6 levels. It adopts the classification level of "Series, Sections, Forms, Branches and Subgroup". As the international garden plant application exchanges

become more frequent, in order to ensure the unity, stability and scientific name of the plant species and ensure the reliability and comparability of information related to the plant species, it is imperative to establish the plant varieties classification system meeting the international general specification and act on international convention. The classification system of wintersweet in agricultural zone cultivars formulated according to international standard "ICNCP" is of great significance for the popularization and application of wintersweet in agricultural zone cultivars and the international registration of wintersweet in agricultural zone cultivars in future (Chen and Lu, 1990).

The standard classification of wintersweet in agricultural zone cultivars: The flower diameter, the color of middle tepal, the color of inner tepal, flower type, the property of middle tepal, flowering period and other traits are important standard to distinguish the wintersweet in agricultural zone cultivars, but which character as the first classification standard is the primary problem of system classification of wintersweet in agricultural zone cultivars:

The flower diameter: The flower diameter is a minor quantitative trait mainly affected by cultivation conditions. After the survey, the author found that there is obvious limitations when the wintersweet in agricultural zones are divided into the types of big flowers, medium flowers and small flowers according to the flower diameter size, because diameter size of the wintersweet in agricultural zones is affected by the blossom degree, the blossom time, measurement method and other factors. For example, in the early flowering period, most of the tepals are inner ones and flower diameter is smaller. After the blossom period, the flowers will gradually in blossom and the flower diameter is larger. In practice often because the measurement is not in the florescence period, it causes data errors of flower diameter and is not conducive to the actual operation; but it is found in the survey that in different cultivation conditions, flower diameters of the same kind are also very different, for example, the flower diameter of intermedius in good soil conditions of Ming Xiaoling Mausoleum is up to 2.5 cm while in the areas with relatively poor soil conditions, the flower diameter is about 1.7 cm; in addition, in different years, there is also a great difference in the flower diameter traits performed by the same plant, for example, for the same plant, it shows the medium flower traits of performance in the first year and shows the large flower traits of performance in the second; therefore, this trait of the flower diameter should be considered comprehensively in variety identification.

The color of the middle tepals: The color of the tepals of the wintersweet in agricultural zone cultivars has the

gradual variations of 'yellow white-light yellow-yellow deep- deep yellow-yellow green'. In wintersweet in agricultural zone cultivars, the yellow green variety is the rare and particular species, such as 'green flowers', 'green buds'. Deep yellow variety has distinctive colors and has high ornamental value, such as 'Jin Zhonghuang', 'Wansu' and so on. The yellow and white variety has large varieties and the variety is very special, such as 'Yin Baozhong', 'Onyx' etc. The color of the middle tepals is affected by the objective condition. There is gradient color for the same plant, while the flower color of different varieties also has a gradient range. It is difficult to determine some white tepals varieties are yellow or white cultivars; when arranging the wintersweet in agricultural zone cultivars, the colors of the affected by the weather, for example, for the same flower, there is a difference between the colors in the sunny or cloudy days and the felt color, or between the outdoor and indoor colors. In addition, when the impressions or backgrounds are different, the colors are also different, for example, the light yellow variety looks like yellow white in full sun.

The color of the inner tepals: The color of the inner tepals has the gradual variations of "no purple lines -a few purple lines-full purple lines". The color of the inner tepals is relatively stable, obvious characters and the characters can show obvious difference among varieties and are closely related wild type. The Concolor varieties have 'Jindie', 'Lasu', the intermedius group varieties have 'Juanbeijinlian', 'Yellow red sword' and Patens varieties have 'Xiaoling', 'Jianhuti' etc.

The flower type: The flower type of wintersweet in agricultural zone cultivars are different and most of the species have their own representative patterns. According to the blossom status of the flower tepals, it can be divided into the bell type, chime type, opening bowl type, bowl type, bell type, disk type, cone type development (wintersweet in agricultural zone type), lotus type and so on, for example, 'Jinzhu' and 'Huangyuqiu' belong to the bell type, 'Qingkousuxin' belongs to the chime type, 'Mozhongdianjin' belongs to the opening bowl type, 'Yinbaodeng' belongs to the bell type, 'Beizhouzisi' belongs to the flat plate type, 'Yangzhou huang' is conical, 'Juanbeijinlian' belongs to the lotus type. The flower type is an important standard pattern to distinguish cultivar, especially the chime and lotus flower types are very special type. But the flower type of some varieties varies with the flowering periods, the flower type is generally not in blossom in the early blooming period, in the flowering stage, the flower type is often bell or bowl type varieties and often at the end of flowering, there is flat plate type.

The shape of the middle tepals: It mainly refers to the differences of the length to width of the tepals, the

shrinkage, roll and other traits. wintersweet in agricultural zones have the narrow strip shape and ellipse shape changes; the top sheet of wintersweet in agricultural zone has two types of pointed and blunt round; there is difference whether the top piece is rolled. Some varieties are straight without the roll, such as "Feihuang" and "Xiaoling", some varieties have very clear roll, such as "Juanbeisuxin" and "Juanbeijinlian"; some varieties have very obvious shrinkage and the edge is undulating, such as "Binglian", "Yunxinbozhou" and other varieties. But it is found from the survey that the character of the tepals width is not easy to recognize and needs the measurement tool to distinguish accurately. The roll degree of the tepals is influenced by the florescence.

The flowering time: In the same site conditions, the flowering difference of wintersweet in agricultural zone cultivars is also very obvious. The early flowering period of wintersweet in agricultural zone cultivars of early flowering class is in in mid November and the flowering period is between late November and the early, middle of December, such as 'Zaola' and other varieties; The early flowering period of wintersweet in agricultural zone cultivars of middle flowering class is in late December and the flowering period is in early, middle January, such as 'Jinzhu', 'Jinzhonghuang' and other varieties; The early flowering period of wintersweet in agricultural zone cultivars of late flowering class is in early February and the flowering period is mainly in the middle and late February, such as 'Wansu', 'Wanzi' and other varieties.

In summary, wintersweet in agricultural zone cultivars have different degrees of difference in many characters. Some of these characters have great changes with the blossom period and environmental conditions, such as the color and flower type. The color is yellow in the blossom and the bud periods and in the middle and late periods, the color of the tepals becomes light; some characters have variation range and there is a larger change on the same plant or even on the same branch of different parts, such as size, number of perianth; some characters are difficult to grasp, such as flavor, micro morphology, biochemical basis and so on; in comparison, the purple lines of the inner tepals purpuratum is relatively stable and obvious and is not affected by the flower period and external conditions.

Based on this understanding, the evolution trend of the varieties of wintersweet in agricultural zone should be: The flower diameter is from small to large; the tepals is from narrow to wide; the perianth segments are from longitudinal curling to the tip roll; the inner tepals are from purple spots, purple lines, purple halo until Concolor; the tepals are from few to many. So even if the dog is determined as the original varieties, the wintersweet in agricultural zone cultivars also have a number of traits of parallel evolution, so it can't have a

clear character as a standard as easy as the plum blossom and the peach blossom. On the basic simultaneous evolution of multiple varieties (Li and Li, 2000; Li *et al.*, 2003), we should pay more attention to the practical application and intuitive, clear characters. The color of the inner tepals has relatively stable, obvious traits and are closely related to the wild type. Besides, the wintersweet in agricultural zone plums are yellow and the inner tepals purple lines are easy to detect. The purple lines belong to the quality traits and easy to operate. So the inner tepals purple lines is a standard classification of wintersweet in agricultural zone cultivars, namely, the classification standard of the variety group is scientific and practical.

RESULTS AND DISCUSSION

In the classification of wintersweet in agricultural zone varieties, the grades used before had the class, level, type, variety group and others and the translation of the names and the use of the names were complexed. Therefore, in the classification of wintersweet in agricultural zone cultivars, we should abandon the past classification which is troublesome and does not comply with ICNCP and make a clarification that user the "breed", there are only three units of "variety group" and "variety" and "graft chimera".

In this study, 'in accordance with ICNCP, scientific characters and practical characters ' is the cultivar classification principle. According to the inner tepals purple lines, the wintersweet in agricultural zone cultivar varieties will be divided into three cultivar groups: *Chimonanthus praecox* Concolor Group, *Chimonanthus praecox* Intermedius Group and *Chimonanthus praecox* Patens Group. And the textual research of the name of the variety group is as follows:

The formal name of concolor group should be: *Chimonanthus praecox* concolor group: The basic synonym:

- *Ch.praecox* (L.)Link var. concolor Mikino in Bot.Mag. Tokyo 23:23.1909

The related synonyms are:

- Concolor Group, Chen Zhixiu, DingBaozhang, etc., 1987
- Form Concolor, Zhao *et al.* (1993)
- Concolor Form, Chen *et al.* (2004)

Concolor Group is a kind of cultivar group which is were not set the purple lines of wintersweet in agricultural zone cultivars and was published regdrd as the cultivar group and type level, but the added word is 'Concolor', therefore, the name of 'Concolor Group' is established and should be the synonym of wintersweet

in agricultural zone cultivars group. According to the 19.7 provisions of the ICNCP, 'the added name of any form of the Latin words published before January 1, 1959, even though they were not published ad made no effect, as long as they comply with the regulations of the establishment of the name of a variety of conditions, if the name used by plants is now thought to represent a species, the added word of the name should be used as the variety added word.'; the 19.13 article regulates, "since January 1, 1959 and later, for the names of a variety, the added word will be formed by one or a few words of any other language except the Latin "; article 20.4 regulates, "the constitute of the word cultivar groups refers to 19.6-19.26. The provisions which manages a variety of words and rules also applies to the group". The new cultivars do not use Latin published since January 1, 1959, but those published before January 1, 1959 has not abandoned just for the use of Latin. The added word "Concolor (1909)" was established.

The formal name of Intermedius Group should be: *Chimonanthus praecox* Intermedius group: The basic synonym:

- *Ch.praecox* (L.)Link var. intermedius Mikino in Bot.Mag. Tokyo 24:300.1910

The related synonyms are:

- Intermedius Form, Chen *et al.* (2004)

Equally, the added word 'intermedius' is established and the formal name of Intermedius Group should be *Chimonanthus praecox* Intermedius Group.

The formal name of patens group should be: *Chimonanthus praecox* patens group: The basic synonym:

- *Ch.praecox* (L.)Link var. patens Tarrill, 1910

The related synonyms are:

- Form Jinhong, Zhao *et al.* (1993)
- Patens Form, Chen *et al.* (2004)

Equally, the added word 'patens' is established and the formal name of Patens Group should be *Chimonanthus praecox* Patens Group.

CONCLUSION

The login of wintersweet in agricultural zone cultivars is within the scope of Dr. Mark Tebbin of American Botanical Garden Association, which is in charge of all woody plants cultivated without the

proprietary or special registration authority, but up to now there has not been Chinese apply for registration of wintersweet in agricultural zone cultivars report. wintersweet in agricultural zone is the specialty of Chinese flowers. I recommend building cultivar germplasm resources garden in the later research work of wintersweet in agricultural zone cultivars across the country as soon as possible and accelerating the breeding, introduction and registration work of fine varieties of wintersweet in agricultural zone. To establish the system of international standard classification of wintersweet in agricultural zone cultivars of wintersweet in agricultural zone cultivars is the basis to promote international communication and is also an important guarantee for the international registration of wintersweet in agricultural zone cultivars.

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