

# Asian and Australasian Journal of Plant Science and Biotechnology

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**Cover photo:** Top left: Wax apple (*Syzygium samaragense*) var. 'Pink' (Shü *et al.*, pp 48-53); bottom right: Five weeks-old *Clematis gouriana* culture (Raja Naika and Krishna, pp 58-60).

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**M. N. V. Prasad, N. Nirupa (India)** Phytoferritins - Implications for Human Health and Nutrition (pp 1-9)

**ABSTRACT**

**Mini-Review:** Ferritin, a metalloprotein, is rich in iron, and ubiquitous in all organisms. Plant ferritins play a pivotal role in many important redox reactions. Iron is an essential element for all forms of life and its limitation of oxidizing to ferric form has a profound impact on the productivity of organisms. The function of ferritin in plants is storage of Fe for short or long periods to protect the cell against the toxic effects of free Fe, thus serving as a primary antioxidant. Iron homeostasis in organisms is regulated at the level of iron uptake. If iron absorption is not tightly regulated, iron overload and associated toxicity occurs. The bioavailability of non-heme ferritin iron has been demonstrated by recent experiments and may provide a model for novel, utilizable, plant-based forms of iron for populations making it a potential target for biofortification. Information on the bioavailability of different forms of iron in the diet would foster research to design balanced diet and appropriate supplementation of required iron to ameliorate a wide variety of genetic background related to iron bioavailability and biosorption. The possible role of ferritin acting against biotic and abiotic stresses, accumulating heavy metals and as a protector of the genome is also reported. Plant ferritin genes have been obtained from many different plants, mostly from legumes. Fortifying plants with ferritin through a transgenic approach would aid in corroborating the existing iron fortifying programmes. Understanding the molecular, biochemical and physiological aspects of the ferritin molecule would be a significant accomplishment to construct plants overexpressing ferritin that require reduced applications of fertilizers, that can grow on marginal lands, and that accumulate bioavailable iron.

**Nafees A. Khan, Sarvajeet Singh, Rahat Nazar, Pervez M. Lone (India)** The Source-Sink Relationship in Mustard (pp 10-18)

**ABSTRACT**

**Invited Review:** Mustard is an important oilseed crop of the tropical and sub-tropical regions of the world. The languid production of oilseeds has converged the attention of agricultural scientists to innovate and implement methods for boosting yield using agricultural, physiological and biotechnological tools. Among other factors, the use of plant growth regulators and management of plant canopy have a proven potential in modulating plant function and improving nutrient use and the source-sink relationship. The present review discusses the factors and the prospects of employment of gibberellic acid and removal of lower leaves as a tool for improving the source-sink relationship in mustard.

**Xiao-ming He, Da-sen Xie, Qing-hua Chen, Qing-wu Peng (China)** Chieh-qua Biotechnology: Progress and Prospects (pp 19-22)

**ABSTRACT**

**Invited Mini-Review:** Chieh-qua (*Benincasa hispida* Cogn.var. Chieh-qua How) is a member of the family Cucurbitaceae. It is a native and important vegetable in China, and widely cultivated throughout south China and Southeast Asia for its immature fruits. The improvement of yield, resistance to disease and stress are the main aims in production and breeding of Chieh-qua. Biotechnology has provided promising approaches for cultivar improvement of this crop. This mini-review introduces the recent researches of *in vitro* culture and molecular marker application in Chieh-qua, including shoot tip and cotyledon culture, mutant selection *in vitro*, application of RAPDs for the testing of seed purity and identification of cultivars, development of molecular markers linked to genes associated with gynoecy. The prospects of biotechnology in heredity and breeding in Chieh-qua are discussed.

**Yong-Zhong Liu, Xiu-Xin Deng (China)** Citrus Breeding and Genetics in China (pp 23-28)

**ABSTRACT**

**Invited Mini-Review:** Citrus is the second important fruit crop in China; the long history of citriculture and richness of germplasm has benefited genetics and breeding research in this country. Today, there are 1000 accessions or so that have been preserved *ex situ* in the National Citrus Germplasm Repository and 101 calli of citrus accessions *in vitro* are maintained in the laboratory of Huazhong Agriculture University. Selections of seedless and early- or late-ripening varieties are two important breeding goals at present in China. Using bud sport and seedling selection, at least 40 strains of seedless or with less seeds and early- or late-ripening were obtained in the past 20 years. Furthermore, China made some progress in germplasm innovation by biotechnology. Until now, about 40 interspecific and intergeneric somatic hybrid combinations were obtained; 244 triploids and 10 tetraploids gained by cross hybridization, and 1000 plantlets gained from culture of seeds and aborted ovules beneath the chimeric part of fruit with elite traits were preserved in the greenhouse or field, which highlights hope for elite cultivar selection in the future.

**Ruijuan Ma, Mingliang Yu, Zhijun Shen (China)** Progress on the Research of Peach Germplasm Resources and Breeding in China (pp 29-32)

**ABSTRACT**

**Invited Mini-Review:** This paper reviews the progress on the research of peach germplasm resources and breeding in China in the last 20 years. Three national peach germplasm repositories were established in the late 1980s. About 1,300 accessions within China and from foreign countries were preserved *ex vitro*. In order to describe peach diversity, China made a "Peach Descriptors" in 1990 based on IBPGI Peach Descriptors in 1980. And a new peach descriptors system "Descriptors and Data

Standard for Peach” was published in 2006. Evaluations were made based on these two descriptors, and evolutions and characterizations were also made through morphology, isozyme analysis, palynology and molecular markers. Breeding varieties with good taste, extension of ripening time, and increased fruit firmness for shipping are the main objectives of the breeding programs in China. Great progress was achieved in honey peach, flat peach and nectarine, especially in nectarine. We are also working on developing molecular markers, including RAPD, SSR and AFLP that are linked to specific characteristics.

## Number 2

**Yen-Cheng Chiang, Pei-Yi Weng, Hsiao-Lan Lai, Chun-Yen Chang (Taiwan)** Research on Therapeutic Landscapes in Taiwan (pp 33-36)

### ABSTRACT

**Invited Mini-Review:** Therapeutical landscape, restorative environment, horticultural therapy, and healing garden are phrases that embody concepts recognized with increasing importance in the field of landscape architecture and design in the 21<sup>st</sup> century. Therapeutical landscape involves the use of natural landscape in therapy for people in healthcare facilities and for the general well-being of other users. Studies have shown that the interaction between nature and people leads not only to physical and mental healing, but also spiritual healing. Therapeutic, or healing, environments expand upon a holistic approach to care, addressing physical, psychological, and emotional well-being through a commitment to the overall healing experience and quality of life for the patient, resident, staff, and families. This article aims to report on and summarize various studies on the healing effect of natural landscape and horticulture activities in Taiwan. These studies and cases involve diverse populations, including hospitals, retirement communities, leisure farms, and nature-based recreational areas. In Taiwan, many studies indicate that healthcare facilities and hospitals interested in providing opportunities for horticultural therapy enable patients to work with plants. Other nature-based environments such as leisure farms and recreational areas are also looking for evidence of the beneficial natural experiences. It is believed that seeing and participating in daily contact experiences with nature – especially healthy (ecology) nature – benefit people’s health; not only do plants provide visual enjoyment, but activities within nature are satisfying and therapeutic for many.

**Liangjun Li (China), Jaime A. Teixeira da Silva (Japan), Beisheng Cao (China)** Aquatic Vegetable Production and Research in China (pp 37-42)

### ABSTRACT

**Invited Mini-Review:** Aquatic vegetables are all crop species growing in paddy fields, pools or lowlands, and have a very long cultivation history in China. There are mainly 12 fresh-water plant classes belonging to 12 families with about 1700 germplasm resources all over the country. They are : lotus (*Nelumbo nucifera* Gaertn), water bamboo (*Zizania caduciflora* Hand. Mazz.), taro (*Colocasia esculenta* Schott), water dropwort (*Oenanthe stolonifera* DC. C.), water spinach (*Ipomoea aquatica* Forsk.), arrowhead (*Sagittaria sagittifolia* L. var. *sinensis* Makino), water chestnut (*Eleocharis tuberosa* Roem. et Schult), water caltrop (*Trapa* spp.), gordon euryale (*Euryale ferox* Salisb.), water cress (*Nasturtium officinale* R.Br), common cattail (*Typha caduciflora* L.) and water shield (*Brasenia schreberi* Gmel). Aquatic vegetables are all enjoyed for their crisp, tasty qualities and special flavor, and most of them have exceptional health and appreciation value. Many of them originate in China, and they are an essential part of the Chinese plant germplasm resource treasury. China also produces more aquatic vegetables than any other country in the world. Nowadays, research focuses on: germplasm resources and breeding, mechanisms of edible organ development and control, processing, and ecology. Facing the challenges of increasing demand for high quality vegetables, future prospects for production and research of aquatic vegetables are also discussed in this article.

**Xiaolei Sun, Weihua Zhang, Sanjun Gu, Chunxing Liu, Qiwei Cao, Zhifeng Wang (China)** Solar Plastic Greenhouses: An Epochal Revolution of Horticulture in China (pp 43-47)

### ABSTRACT

**Invited Mini-Review:** China is one of the earliest countries to grow vegetables in greenhouses in the world. The history of protected vegetable production in China can be traced back to 2000 years ago and divided into three phases according to the ways in which greenhouses were heated. The first phase began in 200 BC when greenhouses were heated by hot-spring water, as documented by Wei Hong (a man of the Han Dynasty) in his book *The Preface of Han Imperial Edict*. The second phase started in 30 BC, when people began heating greenhouses with combustible materials such as firewood. This cultivation technique was detailed in the *Xunli Biography*, another book from the Han Dynasty. Since then, greenhouses had been heated by firewood, coal or oil until the appearance of solar plastic greenhouses (SPGs) in the 1980s, which marked the beginning of the third phase. SPG distinguishes itself from other types of greenhouses by the complete reliance on solar energy for winter production of temperate vegetables. Today, SPGs have been used greatly in China to produce various vegetables, flowers and fruits in cold seasons. The nearly thirty-year history has proved that SPG is a landmark and a revolution in Chinese horticulture. The history and structure of SPG, and its improvements on fundamental structure and cultivation techniques through the years are reviewed.

**Zen-hong Shū, Tzong-shyan Lin, Jung-mao Lai, Chi-cho Huang, Der-nan Wang, Hsiao-hua Pan (Taiwan, ROC)** The Industry and Progress Review on the Cultivation and Physiology of Wax Apple – with Special Reference to ‘Pink’ Variety (pp 48-53)

### ABSTRACT

**Invited Mini-Review:** The wax apple (*Syzygium samarangense*) is a tropical fruit tree and is very common in Southeast Asia,

Taiwan, India and also grows well in Central and South America. The 'Pink' cultivar represents 95% of the planted area in Taiwan (as a result, almost all the research data presented in this paper are based on 'Pink' variety). Despite its name, this cultivar produces fruits varying from pink to deep red, depending on environmental and cultural conditions. Best prices are obtained with big, crispy, thick-fleshed, juicy, sweet and deep red fruits. Fruit quality is affected and improved by many factors, such as light, temperature, position on the tree, growing stage, leaf:fruit ratio, supplemental calcium and manganese applications. Due to successful off-season production techniques, fruits can be harvested all-year-round in Taiwan. Trunk girdling, canopy shading, root pruning and/or flooding create favorable conditions for flower forcing. The highest net carbon dioxide exchange rate for wax apples is about  $9 \mu\text{mol m}^{-2} \text{s}^{-1}$ . Water logging decreases net carbon dioxide exchange rates, stomatal conductance, evaporation and maximum quantum yield of PSII (Fv/Fm), concentrations of chlorophyll and leaf water potential, however, it helps the reproductive phase of wax apples. A single sigmoid growth pattern was found in wax apple fruit development. The concentration of anthocyanin increases during fruit development. The major sugar species in the fruit are fructose and glucose. External sugars enhance red color development on the cultured skin discs. Paper bagging, a standard cultivation procedure, increases fruit hardness, crispiness and color development.

**Zengyong Zhu, Yanfeng Qi, Min Wei, Xiufeng Wang, Huantao Wu (China)** Application of Crop Residues in Protected Cultivation in China (pp 54-57)

#### ABSTRACT

**Invited Mini-Review:** China is a country with abundant crop residue resources and largest area of protected cultivation in the world. The resources of crop residues and their application status are briefly introduced in this paper. Aimed at the reuse of agricultural waste resources and the sustainable development of protected cultivation, the utilization and effects of crop residues under protected cultivation in China are presented. The future prospects and current problems of crop residue application have also been discussed.

**H. Raja Naika, V. Krishna (India)** *In Vitro* Micropropagation of *Clematis gouriana* Roxb. from Nodal Stem Explants (pp 58-60)

#### ABSTRACT

**Original Research Paper:** A micropropagation protocol has been standardized for the medicinal climber *Clematis gouriana* Roxb. Adventitious shoots formed directly from nodal stem explants on Murashige and Skoog (MS) medium supplemented with 3.0 to 5.0 mg l<sup>-1</sup> 6-furfuryl amino purine (FAP) and 0.3 to 0.7 mg l<sup>-1</sup> indole-3-butyric acid (IBA). The frequency of shoot bud production was the highest (mean of  $11.80 \pm 0.32$  shoots per explant) at 4.0 mg l<sup>-1</sup> FAP and 0.5 mg l<sup>-1</sup> IBA. The microshoots rooted well on MS basal medium without plant growth regulators, as well as on MS medium supplemented with 0.1 to 0.5 mg l<sup>-1</sup> IBA. Regenerated plants were successfully acclimatized and about 80% of the hardened regenerants survived under natural conditions.

**Rupa Acharya, Krishnendu Acharya (India)** Evaluation of Nitric Oxide Synthase Status During Disease Progression in Resistant and Susceptible Varieties of *Sesamum indicum* Against *Macrophomina phaseolina* (pp 61-63)

#### ABSTRACT

**Short Communication:** Nitric oxide (NO) is an important molecule in animal and plant system which is produced from L-arginine catalyzed by the enzyme nitric oxide synthase (NOS). NO in plants has been implicated to perform a significant role in several biological systems including defense. The earliest event in the pathogenic recognition is rapid accumulation of reactive oxygen species (ROS) and NO in animals. Likewise, resistant plant pathogen interaction is followed by induction of ROS and reactive nitrogen species like NO. NO has been shown to induce programmed cell death (PCD), although the versatility of NO action in plants is still to be well defined. In the present study we selected a resistant and susceptible variety of *Sesamum indicum*, Rama and Tiliittoma, respectively that were challenged with *Macrophomina phaseolina* (Tassi) Goid. NOS activity of the treated and healthy plants was estimated at every 3 days interval. In the susceptible treated plants a positive correlation was observed between symptom severity and decreased NOS activity whereas a reverse relation was shown by the resistant plants. In the susceptible plants NOS activity decreased up to 55% whereas in resistant plants it was increased up to 11% over the control. In our earlier study it was found that in different compatible host pathogen combination of fungal bacterial and viral component, pathogenesis-related NOS activity was cytosolic and according to kinetics the NOS activity was blocked competitively during diseased condition. We conclude that NOS activity is an important component of resistance or susceptibility of a plant against a pathogen, using sesame as a new model plant.

**Cai-qiong Wu, Jiang-li Lei, Shang-hai Lai, Tao Xu, Yi-yan Xu (China)** Application of 17 Wild Plant Species in Afforestation of an Abandoned Quarry (pp 64-68)

#### ABSTRACT

**Original Research Paper:** In order to rapidly restore the vegetation of an abandoned quarry and improve its ecological and landscape effects, 17 wild plant species with drought and barren soil-tolerance were selected and planted in an abandoned quarry in Shenzhen, Guangdong province in south China, termed the "Fuyuan" quarry. The adaptability of these species to the adverse conditions and their effects on ecological restoration and landscape improvement were studied. Ultimately, only species suitable for afforesting the abandoned quarry were selected. The species introduced were maintained for first one year and then left alone to grow naturally. The increases in plant height and crown diameter of these species were measured at the end of the first year after planting, and their survival percentage and coverage were evaluated after three years. Results showed that *Cudrania cochinchinensis* (Lour.) Kudo et Masam., *Lagerstroemia kweilinensis*, *Cudrania tricuspidata* (Carr.) Bur., *Delavaya toxocarpa* Franch., *Ficus gibbosa* Bl., *Cipadessa cinerascens* (Pell) H.M., *Randia spinosa*, *Pueraria lobata* var. *montana* (Lour.) Merr. and *Bauhinia corymbosa* Roxb. could be applied in the afforestation of the steep and large-scale barren cliff, while *Indigofera enneaphylla* L. and *Ficus tikoua* Bureau. were suitable for greening the slashed land.

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Control system	Selectable for constant operation or daytime / nighttime switch operation
Temperature	+5 to 45°C, When light is on: +15 to 40°C
Lighting	4.2W CCFL X 3 pcs. X 8 chambers / Luminescent color: 3-band white lamp (Standard)
Volume of light photon (5-point average measurement)	100 $\mu\text{molm}^{-2}\text{s}^{-1}$ (115 mm from lighting) / 60 $\mu\text{molm}^{-2}\text{s}^{-1}$ (225 mm from lighting) *With 3-band white lamp X 3 pcs.
Power supply	Shingle Phase 100V, 18A



LH-30CCFL-8CT

## Plant Microtome

No need for any pretreatment !

### ●Features

- Plant Microtome allows easy preparation of thin, uniform and highly precise tissue segments from raw plant samples without pretreatment such as paraffin embedding or freezing.
- Manual and Automatic types of Plant Microtome are available.

Model	MT-3	MTH-1
Dimension(mm)	W300 X D400 X H230	W200 X D385 X H230
Maximam sample diameter	Max. $\phi$ 12mm	
Sample thickness	10-700 $\mu\text{m}$	10 $\mu\text{m}$ -several mm
Number of setting samples	1-99 pcs.	-
Cutting speed	0-68 r.p.m (60Hz)	-



MT-3



MTH-1



**NKsystem** Bio & Clean Scientific Instruments

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