Fig. 2. Percentage of measured ears (80 ears $\pm$ SE) that were 14 to 21 cm (5.5 to 8.3 inches) long for each cultivar grown at the 6-inch (15-cm) in-row spacing in 2000. Length measurements were sorted into 1-cm (0.4-inch) increments to evaluate percent size distribution of marketable ears. Statistically significance differences in the percentages among cultivars at various ear lengths are indicated at $P < 0.05$ (*) and $P < 0.01$ (**) above ear length classes.

7 inches for 'Temptation' and 'Sweet Symphony', these studies suggest an optimal in-row spacing of 8 inches. At this spacing, these two cultivars provided a minimum 7-inch ear for 2 of the 3 years. The improvement in average ear length did not justify in-row spacing beyond 8 inches or a target plant population of 26,000 plants/acre, if high marketable yields were also desired.

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Current Status of Human Issues in Horticulture in Korea

Hye Ran Kwack¹ and
Paula Diane Relf²

ADDITIONAL INDEX WORDS. alternative treatments, graduate program, horticultural therapy courses, mentally handicapped, research societies, research papers, mental illness, interdisciplinary studies, clinical implementation

SUMMARY. As the level of urbanization has increased, many people in Korea have begun to recognize the beneficial effects of plants in our immediate surroundings and involvement in horticultural activities. Today, an increasing number of Koreans attempt to improve the quality of life and enhance educational effectiveness through horticultural activities. Kindergarten, elementary, middle, and high schools have initiated garden-based programs. Some universities include courses focusing on horticulture applications to human well-being in their regular graduate programs or in their social education curricula. A few general hospitals, psychiatric hospitals, and rehabilitation centers have begun applying horticulture as a means of treatment. Most of the research articles in Korea on various aspects of human issues in horticulture have been published since the foundation of two academic societies, the Korean Horticultural Therapy Association and the Korean Society for Plants, People, and Environment. These articles are primarily focused on the areas of school gardening, healing gardens, and psychological or physiological effects of horticultural activities. For the future development of human issues in horticulture in Korea, several areas need to be enhanced including: interdisciplinary studies of horticulture and social education; development of different skills, techniques,

¹Postdoctoral, Department of Horticulture, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061-0327.

²Professor, Department of Horticulture, Virginia Polytechnic Institute and State University, Blacksburg, VA 24061-0327.

and scales to validate the effects of horticultural therapy, healing gardens, and gardening as a teaching tool in public education; and an organization empowered to certify horticultural therapists.

In Korea, as in the U.S., horticulture traditionally is regarded as simply a part of agriculture. That is, the primary concept of horticulture has been to "produce something for living" (Kwack, 1984). However, as urbanization removes people from easy access to nature and the daily experience of nurturing plants, the significance of horticulture in human therapy and well-being has become more important. Recognition of this is beginning to be emphasized by Korean horticultural scientists, and attempts have been made to study and apply human issues in horticulture within their research. Health care and other professionals in Korea are beginning to recognize the healing effects of plants based on research and demonstration programs conducted to identify the healing effects of horticultural therapy. Several studies have been conducted to establish the effectiveness of plants in bringing about positive responses in various populations, using statistical analysis to evaluate changes in behavior and various physical and physiological components of stress.

History

Over the past 20 years, several significant events have facilitated the growth of horticultural therapy in Korea. In 1984, Horticultural therapy was introduced as a new field of horticulture in Korea through publications by B.H. Kwack, Korea University, Seoul (Kwack, 1984). In 1993, Korea University offered the course "Socio-horticultural Implementation" to graduate students in the Department of Horticultural Science. Subsequently, other universities have initiated curricula or courses in related areas. The International Horticulture Congress (IHC) in Kyoto, Japan in 1994, which included the Symposium Horticulture in Human Life, Culture, and Environment (Matuso and Relf, 1995), stimulated significant interest among participants from Korea. Since the IHC, two monographs have been published in Korea (Kurose, 1997; Son et al., 1997). Most recently, the founding of

two academic societies has organized interested individuals, provided workshops and symposia to increase awareness and education, and resulted in valuable publications. The Korean Horticultural Therapy Association (KHTA), founded at Kunkook University in 1997, has held three symposia and six workshops. The Korean Society for Plants, People, and the Environment (KSPPE), founded in 1998 has held three symposia (Sim, 2000a).

Applications of human issues in horticulture

The increased awareness of the importance of horticulture to human life has led to the development of numerous programs in Korea. Schools use plants as a tool for educating students. Institutions such as hospitals, rehabilitation centers, and correctional facilities are also incorporating horticulture into their treatment programs. Directly linked to this, an increasing number of universities offer courses and degrees in the study of horticulture for health or therapy.

SCHOOL GARDEN-BASED PROGRAMS. School gardens in Korea are primarily designed as an educational tool for students utilizing the environment around school buildings. Horticultural activities at educational facilities are also intended to promote student emotional development, increase student cooperation, and provide a desirable atmosphere for their studies (Kim, 1998).

Kindergarten. Kindergartens attempt to provide an environment conducive to the growth and development of preschool children (age 5 to 7 years) and to achieve educational goals for successful democratic citizens. Moon-kyung kindergarten in An-Yang has recently become a horticultural kindergarten adopting play garden concepts for their children's main program. Its educational programs are

related to plants and include outdoor gardening activities and excursions, games using horticultural crops, crafts and flower decoration, and cooking and art composed of sketching, writing, and preparation of picture books for their children. Traditional Korean activities such as Kimchee making or nail-dyeing with balsam flowers (*Impatiens balsamifera*) were specifically included in the programs and teachers stated they provided the most unique and interesting characteristics of these programs (Choi and Son, 1999).

According to studies by Choi and Son (2000), conducting play garden programs decreased the degree of withdrawal, somatic complaints, and anxiousness and depression measured by the KCBL (Korean version-children behavior checklist) (Table 1). In addition, vocabulary changes indicated significant increases in terms in the areas life (human, mind, spirit, body, etc.), plants [lemon balm (*Melissa officinalis*), pineapple mint (*Mentha suaveolens variegata*), cosmos (*Cosmos bipinnatus*), rosemary (*Rosmarinus officinalis*), etc.], and use of plants (cooking, herb tea, sneaker garden, pot-pourri, etc.) (Fig. 1).

Although some research (Choi and Son, 1999; Kwon et al., 2000; Lee and Kim, 1999) dealing with nature-focused learning programs in kindergarten has reported the importance of horticulture at this educational level, most kindergartens in Korea use sports, language, and mathematics rather than horticulture as the central theme. To increase the use of horticulture will require outdoor spaces, gardening facilities, and a legal basis for the provisions of nature-focused learning programs in kindergarten.

Elementary, middle, and high schools. Most elementary, middle and high schools are centralized in large cities with high populations. The students are not close to nature and do not have much opportunity to be

Table 1. Changes in the behavior of kindergarteners before and after participation in a school play garden (Choi and Son, 2000).

Behavior ^a	Preprogram ^b (mean ± SD)	Postprogram ^b (mean ± SD)	Difference
Withdrawn	62.7 ± 14.9	55.1 ± 10.3	-7.6*
Somatic complaint	52.7 ± 4.3	52.0 ± 4.3	-0.7
Anxious/depressed	53.2 ± 5.2	51.6 ± 4.6	-1.6*

^aNumber of behavior occurrences.

^bTested using the Korean version-children behavior checklist.

*Significance at $P < 0.05$.

Fig. 1. Changes in the number of vocabulary list words used by kindergarteners between a play garden preprogram and postprogram in categories related to human/plant life, plant names, and uses of plants. (Choi and Son, 2000). Examples of life words are human, mind, spirit, and body; examples of plant words are lemon balm, pineapple mint, and cosmos; examples of utilization words are cooking, herb tea, sneaker garden, and pot-pourri.

around plants or care for them. According to data presented by Sim (1985), trees and shrubs planted along the sunny side of school buildings are the most common feature of school gardens throughout the country. Practical science courses utilizing plants in public schools have shifted from 2 h/week for grades 4 to 6 to only 1 h/week for grades 3 to 6 grades (Korea Dept. of Education, 1992). Despite initial efforts, horticulture activities in kindergarten, elementary, middle, and high school are not conducted systematically in part due to a shortage of teacher's skill, textbooks, facilities, and maintenance (Chung et al., 1999; Lee and Kim, 1999).

APPLICATIONS OF HORTICULTURAL THERAPY. The number of hospitals, rehab facilities, and prisons using horticulture as a therapeutic tool continue to increase as research substantiates the value and impact of this tool.

Hospitals. Currently, application of horticultural therapy is relatively low, with some hospitals of rehabilitation medicine including horticultural therapy programs as part of their vocational education and professional rehabilitation for patients (Chung, 1995). A few hospitals are using horticultural therapy in the rehabilitation of brain damaged and stroke patients. One example is Hyo-ja Hospital for

elderly people in Yong-In, which conducts horticultural therapy with a horticultural therapist, volunteers, and medical doctors. Chungang Hospital in Seoul implements horticultural therapy for psychiatric patients once a week. The utilization of horticultural therapy is increasing, in part, because it is beginning to be recognized as an effective therapeutic tool to develop memory, socialization, self-esteem, and a new attitude of daily life for stroke patients. This increased recognition of benefits is due to publication of related research papers such as Na et al. (1999), which show a therapeutic effect through strengthening of language and recognition function. To elucidate the clinical effect of horticultural therapy, different kinds of medical tools such as electroencephalogram (EEG), and blood pressure and research measurement tools such as Beck Depression Inventory, (Beck et al., 1996), Functional Independence Measure (1996), and the Cognitive Capacity Screening Examination (Jacobs et al., 1977) have been used (Son et al., 2000). Research conducted with dementia patients in hospitals reported the positive effects of horticultural therapy on depression, self-esteem, orientation, and language skills (Chung, 1995; Song, 1997). As this type of research continues, additional hospitals will integrate horticultural therapy into their treatment programs.

Rehabilitation centers. Rehabilitation centers, social welfare centers, and special schools for disabled clients are distinguished according to the difference in symptoms of clientele such as visual, auditory, mental, and emotional disabilities. These facilities provide therapy, education, professional rehabilitation, and protective caring. There are examples of these types of facilities using horticultural therapy in

Korea (Korea Dept. of Education, 1992). Ae-kwang-won facility for mentally handicapped persons in Ko-je is equipped with a therapeutic garden and provides horticultural therapy programming regularly for the rehabilitation of their patients (Kang, 1999). Based on horticultural therapy programs and research conducted with mentally retarded and physically disabled persons, horticultural therapy is regarded as a rehabilitative tool to enhance the degree of cognition, socialization, physical ability, and vocational training (Ko et al., 2000; Lee et al., 1998).

Correction facilities. As in the case of other countries, Korean correction facilities are set up in order for the prisoners to "get the mind correction and enlightenment for the recognition of esteemed human life" (Korea Dept. of Law, 1993). Environmental beautification, flowerbed construction, and plant care are frequent activities for prisoners (Korea Dept. of Law, 1993). In fact, horticultural therapy is utilized in prisons often, and there are training programs with the intent of providing a certificate leading to professional work. Only a few juvenile facilities exist where young offenders can get experience in horticulture and farming. Despite this, the usefulness of horticulture as a tool for rehabilitation and education seems widely acknowledged. Case studies conducted on correctional facilities have reported the positive effect of horticultural therapy on behavioral changes of prisoners, alcoholics, and probationers (Park and Gee, 2000). Ejung-bu Prison in Ejung-bu reported that growing and smelling of night-blooming cestrum (*Cestrum nocturnum*) reduced violence, mental instability, and irritability of their prisoners (Park and Gee, 2000).

UNIVERSITY PROGRAMS. As a result of the increased use of horticulture and the expanded knowledge base, a number of universities offer curricula in human issues in horticulture while others offer a single course.

Graduate school, Dangkook University, Seoul. This university offers a degree for individuals who will work in social services using horticultural therapy. Training is targeted for teachers, nurses, and other related professionals who work with preschool, elementary, junior high, and special education students; individuals with physical and mental disabilities; and geriat-

ric patients. The program provides a strong background in horticultural activities and their application to therapeutic goals.

Horticultural therapy curriculum, Institute for Special Education, Konkuk University, Seoul. The purpose of this curriculum is to study various human and environmental relationships, overall environmental restorations, and the application of nature to rehabilitation and recovery within human life. The KHTA has offered the program of study at the university since March 1999. Students completing the curriculum with an examination score of higher than 70% are issued an HTR Public Qualification Certificate. Basics of horticultural therapy and horticulture are studied to acquire both theoretical and practical perspectives. Applications of horticultural therapy techniques are learned from lectures and a volunteer practicum at facilities such as psychiatric hospitals or nursing care centers are required.

Special educational curriculum for horticultural therapists, Institute for Special Education, Korea University, Seoul. This curriculum is intended to provide knowledge and skills in medical treatment and rehabilitation utilizing horticultural activities for individuals with mental handicaps and psychiatric disorders. It leads to certification by the institute as a horticultural therapist.

Other universities that offer courses in horticultural therapy are as follows: Urban Horticulture Dept., Shingu Junior College (major elective 3 credits); Horticulture Dept., Seoul Women's University (major elective 3 credits); Horticulture Dept., Dangoon University (general culture 1 credit); and Horticulture Dept., Hyosung Catholic University (major required 3 credits)

Research societies

As the number of individuals involved in human issues in horticulture increased from new or expanding horticultural programs and university courses, the need arose for organized professional associations. The founding of two Korean academic societies has organized members and provided workshops, symposia, and publications to increase awareness and education in horticultural therapy and human issues in horticulture.

KOREAN HORTICULTURAL

THERAPY ASSOCIATION. KHTA aims at establishing 1) the academic and theoretical basis of horticultural therapy, 2) educational programs for the implementation of therapy and rehabilitation through horticulture, and 3) health recovery through environmental concerns. Founded 15 Nov. 1997, KHTA is made up of about 200 members from universities, industries, and research institutes consisting of regular, student, and special members. For the purpose of educating and training members, they offer workshops, seminars, and symposia. Three symposia with published proceedings have been offered (Son, 1998; Son, 1999, 2000).

KHTA members studying the visual effect of indoor plants found that observing certain indoor plants resulted in positive changes in EEG, blood pressure, pulse, and semantic differential scale (Lee et al., 1998; Son et al., 2000). Through these types of studies, the clinical effect of indoor plants to stabilize human mental status may become understood.

KOREAN SOCIETY FOR PLANTS, PEOPLE, AND ENVIRONMENT. This society aims to study all aspects of relationships of plants with the human, man-made, and natural environment. KSPPE members have studied construction and effects of healing gardens, school landscaping, and psychological effects of viewing landscapes. Three international symposia with published proceedings have been sponsored (Sim, 1998, 1999, 2000b).

Published research

Although B.H. Kwack (1984) introduced sociohorticulture to Korea and published the first paper on horticultural therapy over 15 years ago, most research and has been conducted and published in the last 5 years. After the Korea University offered the course in sociohorticultural implementation to graduate students in 1993, horticultural therapy and human issues in horticulture papers started to increase. With the organization of KHTA and KSPPE, significant publication increases have been seen.

All refereed journal articles and publications related to human issues in horticulture since its introduction to Korea were collected and analyzed for similarity of topics. The 120 articles thus identified were then categorized into basic, clinical, and landscaping

areas. The basic category dealing with subjects such as general definition, benefit of mental health through horticultural therapy, and importance of alternative medicine had 60 (50%) articles. The clinical category dealing with subjects such as application of horticultural therapy programs, plants used as aroma therapy, and purification of air pollutants by foliage plants contained 38 (32%) articles. The landscaping category dealing with healing garden effects and construction, school landscaping, and visual or psychological effects of landscapes contained 22 (18%) articles. The populations most frequently reported in the reviewed papers and the number of articles found were children (22), elderly (23), individuals with mental retardation (35), persons on probation (8), stroke victims (5), and individuals with psychiatric disabilities (27).

Conclusions

Today horticulture is being recognized as an effective tool for enhancing human well-being and quality of life in Korea. Until recently, the effects of horticultural therapy were only recognized by anecdotal data. As a result of increased research and publications, living plants in our environment are now beginning to be viewed as essential rather than as alternative elements, and the areas of human issues in horticulture application enlarged. Schools have begun to use horticulture as means of educating students in mathematics, science, art, and other subjects. Institutions such as hospitals, rehabilitation centers, and correctional facilities are also incorporating horticultural therapy into their programs to treat and rehabilitate clients. Universities offer courses and degrees in the field of horticultural therapy, while the Korean academic societies offer workshops, symposia, and published proceedings to educate their members on the uses of horticulture to improve human health and quality of life, and promote the profession. Horticultural therapists are becoming recognized as professionals, and they will play an increasingly important role within society. In addition, other careers are opened for horticulturists working with people such as in the areas of adult and youth education and community gardening. For the future of human issues in horticulture in Korea, more interdisciplinary

nary studies of methodologies, benefits, and effectiveness are needed.

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