Analysis of Horticultural Activity Programs in Research Articles on Horticultural Therapy for Children in Korean Journals

Suk Young Lee1, Eu Jean Jang2, and Jongyun Kim3*

1Master student, Department of Horticulture and Biotechnology, Korea University, Seoul 02841, Republic of Korea
2Research professor, Institute of Life Science and Natural Resources, Korea University, Seoul 02841, Republic of Korea
3Professor, Department of Plant Biotechnology, Korea University, Seoul 02841, Republic of Korea

ABSTRACT

Background and objective: The objective of this study was to analyze the current research trends in horticultural therapy for children by examining articles published in Korean journals over the past 20 years.

Methods: A total of 76 experimental articles from 22 journals were analyzed to determine the publication status, horticultural activity programs, and plant species used in the programs.

Results: The results showed that the Journal of People, Plants, and Environment (57.9%) and horticulture majors (43.4%) showed the biggest number of publications of articles related to horticultural therapy for children. Most horticultural activity programs for children consisted of 11 to 15 sessions (36.4%), held once a week (61.0%), and lasted for ten weeks or less (33.8%), with each session lasting 31 to 60 minutes (53.2%). Most programs had groups of ten or fewer participants (40.3%) and were conducted indoors (75.3%). Although the activities varied among journals and authors’ majors, arts and crafts activities (41.5%) were the most common type of horticultural activity program for children. The analysis of plant species used in horticultural activities for children revealed that flowers were the most frequently used (49.5%), followed by vegetables (19.4%). Regarding the types of plant usage, cut flowers (33.5%) and seedlings (33.1%) were most frequently used, which is because cut flowers were mostly used in arts and crafts, and seedlings in cultivation activities. However, 53.8% of the plant materials were not clearly identified in the articles, indicating a lack of consideration for the plant materials used. According to the analysis of the sources of plants used in the horticultural activities, over 80% of flowers and 60% of vegetables were obtained through purchase for the program.

Conclusion: In conclusion, it is necessary to increase the ratio of plant cultivation and observation activities to preserve the essence of horticultural therapy, as well as to select suitable plant species and develop effective programs for horticultural therapy to bring various beneficial effects to children.

Keywords: children in nature, gardening, plant cultivation, horticultural therapy program, lifecycle of plants, plant materials in horticultural therapy

Introduction

Communities in the currently urbanized society are constantly shrinking, giving rise to the newly coined word ‘nano-society’ and strengthening the value of individualism (Kim et al., 2022). There are also demands for quick information acquisition and immediate results due to technological advancements. In this society, children grow up lacking sociability, consideration, and patience, as well as an awareness of the importance of life and the environment, since they are disconnected from nature. Contrary to urbanization and the rapid flow of modern society, growing plants requires patience to wait for the growth and fruition of living things, and the time of patience enables humans to experience the flow of the seasons, the rhythm of nature, and the lifecycle of growth, fruition, and death, as well
as to gain insight and understanding of human life (Relf, 1998). Humans have evolved by building a symbiotic relationship with plants as part of nature, and plants are not only objects for survival but also affect the living environment and quality of life (Suh et al., 2000). Thus, horticultural therapy using various horticultural activities is actively implemented to solve physical, psychological, and social problems through the relationship between humans and plants.

In particular, for children undergoing rapid and remarkable development, their experiences during childhood have a critical impact throughout their lives. Additionally, during this period when the foundations for development in all areas are established, physical, cognitive, emotional, and social development is achieved through the formation of interactive relationships (Hwang et al., 2008). Moreover, the sensory abilities of childhood when the brain is most sensitive to the senses are based on the skills to understand and interact with the world around them, which are learned simultaneously through multiple senses (Edelman et al., 2014). Therefore, horticultural activities using plants that stimulate the five senses help children develop an understanding of life and nature, foster mutual exchange, and gain insight into relationships with humans through experiences of observing, nurturing, and sharing, while also improving children’s self-esteem through patience in waiting for fruition as well as their sense of achievement (Choi, 2003). Moreover, horticultural activities provide experiences of autonomy, independence, and self-efficacy through problem-solving skills acquired from interaction with nature (Noh, 2012) and have the effect of environmental education for people to not only achieve cognitive and physical development but also realize the importance of nature and knowledge about living things in general (Suh et al., 2000). Thus, studies verifying the diverse effects of horticultural therapy for children are being conducted to improve children’s character (Joo and Kim, 2006), sociality (Jeong and Lee, 2013), and self-esteem (Kwack et al., 2015).

As such, it is important to organize suitable horticultural activity programs for children to obtain positive effects through horticultural therapy in childhood. Children's cognitive development, which expands their interest and curiosity toward the natural world, is promoted through direct contact with nature. Therefore, it is crucial to implement activities that provide direct experiences rather than indirect ones so that children can understand life and nature and take responsibility for the conservation of nature (Noh, 2012). Growing plants offers humans a direct experience of nature, enabling them to feel seasonal changes, understand ecosystems, and observe lifecycles, which are some things they cannot do in other areas. Thus, when designing horticultural activity programs, it is necessary to include activities based on direct experience of actually growing plants.

Previous studies that analyzed the effects of horticultural therapy on children (Kim, 2012; Kang, 2013; Hwang, 2014) have examined factors such as the current status of research publications as well as subjects and horticultural activities, but there are insufficient studies analyzing the types and sources of plants used in the programs. Among the elements of horticulture, which include humans, plants, and the environment, plants are very diverse and extensive; thus, it is necessary to conduct research on plant materials suitable for the target and purpose of the programs and to design programs accordingly. Moreover, since the main content of horticultural activities is actually growing plants, it is essential to define authentic horticultural activities when they involve the harvests of what the participants grew and obtained as the materials used in the programs (Matsuo, 1998). Furthermore, it is necessary to consider the source, such as how the plants are obtained, in order for the plants to be recognized as important elements of the activity.

Therefore, this study was conducted to analyze the current status of research articles on horticultural therapy for children published in Korean journals over the past 20 years, the composition and content of horticultural activity programs, plant species, types of plant usage, relevance with horticultural activities, whether the plant names are provided, frequency of use, and source. This is to provide reference materials later in organizing programs for effective horticultural therapy and suggest the direction for further advancement in the development of new horticultural activity programs.
Research Methods

Selection of research articles

For this study, ‘horticultural therapy’, ‘horticultural activity’, and ‘horticultural program’ were used as search words to select the research articles published in Korean journals related to horticultural therapy for the past 20 years from 2001 to 2021 through Research Information Sharing Service (RISS) and National Assembly Library. Out of a total of 380 articles searched, 114 articles on children including preschool children aged 2-6 and schoolchildren aged 6-12 (Choi and Park, 2005; Hwang et al., 2008) were initially selected. Then, a second round of selection was conducted to include only experimental studies that establish causal relationships among variables to prove the effects of horticultural therapy. As a result, 76 articles published in total 22 journals were selected for final analysis, excluding preference surveys, case studies, and articles designed with multiple independent variables.

Content and analysis of research

The publication status of the 76 selected research articles on horticultural therapy for children was classified by year, journal, and authors’ major. The majors of authors were classified based on frequency into horticulture, education, welfare, and multidisciplinary in case where authors with two or more majors participated. To determine the composition of horticultural activity programs for horticultural therapy, the total number of program sessions, session intervals, total duration, duration per session, number of participants, and location were examined. Horticultural activities were classified into cultivation, arts and crafts, cooking, learning, and other activities by revising and supplementing previous studies (Ji et al., 2010; Kim, 2012). The current status was analyzed with 1,365 horticultural activities derived after processing multiple responses of horticultural activities in a total of 1,253 programs. Moreover, to identify the types of plants used in the programs as well as the current status and sources, this study classified the plant species into flowers, vegetables, herbs, fruits, and artificial flowers based on the plant taxonomy in the study by Son et al. (2006). Types of plant usage were classified into seedlings, cut flowers, the harvest and collections from nature, and seeds. Sources of plants used in horticultural activities were analyzed by classifying them into purchase, cultivation and harvest, and collections from nature.

For data analysis, data coding was performed using MS Excel, and frequency analysis to find out the publication status of the articles, cross-tabulation and chi-square test were used to analyze the relationship between horticultural activities and plant species, types of usage as well as sources. All statistical analysis was conducted using the SPSS v.26.0 statistical package program (IBM Co., Armonk, NY, USA), and the significance level was set at p<0.05.

Results and Discussion

Status of publications by year, journal, and authors’ major

As for publications of horticultural therapy articles by year, research articles on horticultural therapy for all age groups, including non-children, showed an overall upward trend until 2010, and articles on horticultural therapy for children showed an upward trend until 2014, after which there was a decline until 2019 (Fig. 1A). As a result of examining the publication status of articles by age group, there were differences by year, but generally, the percentage of articles on horticultural therapy for adults was the highest, and children and the elderly were similar, while the percentage of articles on horticultural therapy for teenagers was the lowest (Fig. 1B). Among all horticultural therapy articles, the percentage of articles on horticultural therapy for children showed an upward trend from 2006 and accounted for a relatively high percentage of about 40 to 50% from 2011 to 2014, except for 2012. This indicates that research on horticultural therapy for children had been actively conducted during this period. There is a continuous increase in research on art therapy, music therapy, and occupational therapy, which are part of complementary and alternative therapies, including horticultural therapy. Based on the study results by Park et al. (2014) that among all age groups, the percentage of subjects aged 19 or below...
was the highest at 28-47%, it could be seen that there is ongoing research on various therapies for children.

The publication status of articles on horticultural therapy for children by the journal is as follows. Out of a total of 22 journals, a majority were the Journal of People, Plants, and Environment (44 articles, 57.9%), followed by the Journal of Korean Practical Arts Education (5 articles, 6.6%), Horticultural Science & Technology (4 articles, 5.3%), Journal of Agriculture & Life Sciences (3 articles, 3.9%), and Journal of Korean Practical Arts Education Research (3 articles, 3.9%). Other 17 journals, including the Journal of Psychology and Behavior, The Korean Journal Child Education, and Flower Research Journal, published one article each (Table 1). This showed that while the Journal of People, Plants, and Environment published most articles on horticultural therapy for children, many other journals were also publishing articles on horticultural therapy for children. In particular, the Journal of Korean Practical Arts Education and the Journal of Korean Practical Arts Education Research that mostly study topics related to children were also focusing on the effects of children’s education through horticultural therapy.

As for the publication status of articles on horticultural therapy for children based on the authors’ major, 33 articles (43.4%) were published by authors majoring in horticulture, accounting for the biggest share of articles on this topic, followed by 21 articles (27.6%) by authors majoring in multidisciplinary, 16 articles (21.1%) by authors majoring in education, and 6 articles (7.9%) by authors majoring in welfare (Table 2). The fact that 27.6% of related articles were published in multidisciplinary majors was similar to the study by Hwang (2014), which suggest that research
on horticultural therapy is actively conducted not only in the field of horticulture but also in various disciplines such as psychiatry, nursing, psychology, early childhood education, special education, and social welfare. The fact that the percentage of publications in the education major was the second-highest after the horticulture major was consistent with the study results by Ji et al. (2010) who analyzed the study tendency of Korean master’s and doctoral dissertations on horticultural therapy published in 2010.

Various previous studies proved that horticultural activities had educational effects on the improvement of children’s concentration (Jang et al., 2012), creative thinking skills (Jeong et al., 2014), and scientific attitude and inquiry skills (Jeong et al., 2009). This indicates that research on horticultural therapy is also actively being conducted in the field of education. Nonetheless, horticulture majors have been conducting most studies on horticultural therapy for children thus far. It seems that more systematic research is needed through collaboration not only with the field of education but also with other related disciplines in the future.

**Analysis of horticultural activities**

As a result of analyzing program sessions, the number of participants, and the location to find information on the composition of horticultural activity programs conducted in 76 articles on horticultural therapy for children, 36.4% were conducted in 11-15 sessions and 33.8% in 16-20 sessions, showing that most programs were conducted in 11 to 20 sessions (Fig. 2A). As for the interval between sessions, 61.0% were conducted once a week and 26.0% twice a week, indicating that most programs were conducted 1-2 times a week, which was similar to the results of previous studies (Oh et al., 2006; Ji et al., 2010; Kang, 2013) (Fig. 2B). For the total duration of the programs, 33.8% were conducted for 10 weeks or less, and 31.2% were conducted for 11-15 weeks, indicating that a majority of the programs were conducted for 15 weeks or approximately 3-4 months (Fig. 2C). This may have been in light of the characteristics of domestic educational institutions, where programs are implemented based on one semester, excluding school vacations. According to previous studies analyzing the effects of horticultural therapy (Hong, 2006; Jang et al., 2010), the effect size of the program was high when it had 21-25 sessions, 21-30 sessions, or over 31 sessions. However, it is necessary to organize horticultural activity programs considering the overall program duration in order to experience the entire growth process of various plants that have different cultivation periods and harvest times.

For the duration of each session, 53.2% were 31-60 minutes long (Fig. 2D). Since childhood is the time when brains are developing (Edelman et al., 2014), children can concentrate for a shorter period time compared to adults, which is why each session is organized to be less than 1 hour. As for the number of participants, 40.3% had 10 participants or less, and 31.2% had 11-20 participants, showing that most programs had 20 participants or less (Fig. 2E). As proposed in previous research that analyzed horticultural activity programs by participant (Oh et al., 2006), implementing programs with a few participants of 10 or less enables more focus on each individual participant and increases the range of activities in a limited space. In the case of location, 75.3% were conducted indoors, 3.9% outdoors, and 20.8% both indoors and outdoors, showing that most horticultural activities were conducted indoors (Fig. 2F). Indoors included educational institutions for children such as schools, kindergartens, and daycare centers, as well as local children’s centers and welfare facilities. Outdoor

<table>
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<tr>
<th>The major of authors</th>
<th>Number of articles (N)</th>
<th>Percentage (%)</th>
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<tbody>
<tr>
<td>Horticulture</td>
<td>33</td>
<td>43.4</td>
</tr>
<tr>
<td>Education</td>
<td>16</td>
<td>21.1</td>
</tr>
<tr>
<td>Welfare</td>
<td>6</td>
<td>7.9</td>
</tr>
<tr>
<td>Multidisciplinary</td>
<td>21</td>
<td>27.6</td>
</tr>
<tr>
<td>Total</td>
<td>76</td>
<td>100.0</td>
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Activities were mostly performed in gardens within children’s educational institutions, and thus in some cases, activities were conducted both indoors and outdoors. However, there was still a significantly higher percentage of programs carried out indoors.

As a result of analyzing a total of 1,365 horticultural activities, the majority consisted of arts and crafts (41.5%), followed by cultivation (37.4%), learning (11.6%), cooking (5.8%), and others (3.6%) (Fig. 3A). Although there was no clear pattern in activities by year, there were more arts and crafts activities than cultivation overall, which was consistent with previous study results (Kang, 2013; Hwang, 2014) indicating that arts and crafts activities were the most prevalent in programs for horticultural therapy. This is because arts and crafts activities provide an immediate sense of achievement through the completion of the final product, and indoor activities are preferred more since they are less affected by the weather and location (Lee et al., 2009), which suggests that most horticultural activity programs were focused on the outcome rather than the process (Ji et al., 2010). The results of this study also showed that there was a higher percentage of indoor space than outdoor space as the location for the program (Fig. 2F), which suggests that, due to the environmental characteristics of educational institutions where most programs are implemented, there was a higher preference for arts and crafts activities, which have relatively fewer space constraints, compared to cultivation activities that require dedicated space and facilities for growing plants. Since it is difficult to secure space for gardening at schools in the city and to carry out horticultural activities outdoors due to the limited time and financial costs (Moon et al., 2012), it is necessary to come up with ways to ensure space, materials, and tools to grow plants for outdoor horticultural activities, allowing children to have direct contact and experience with nature, grow and observe plants. Moreover, since the programs were mostly implemented for 15 weeks or less (Fig. 2C), there seemed to be limitations in growing plants in a limited period of time. Thus, by adjusting the program duration or using plant materials with a short lifecycle, it would be possible to organize programs that allow children to experience the entire lifecycle of plants. This would enable the inclusion of various cultivation activities, as well as horticultural activities using plants that children personally...

Fig. 2. The analysis of the information about the composition of horticultural activity programs. A: total number of sessions, B: interval between sessions, C: duration of sessions (weeks), D: processing time (min) per session, E: number of participants (people) per group, F: location of activity.
As a result of analyzing horticultural activities implemented in each journal, the journal showing the highest percentage of arts and crafts activities was the Journal of Agriculture and Life Sciences (52.4%), followed by the Journal of People, Plants, and Environment (46.0%) and the Journal of Korean Practical Arts Education (40.3%). The journals showing a high percentage of cultivation activities were Horticultural Science and Technology (62.3%) and the Journal of Korean Practical Arts Education Research (43.9%), while other journals showed a similar proportion of cultivation (39.9%) and arts and crafts (39.0%). In particular, the percentage of arts and crafts activities was less than 13% in Horticultural Science and Technology and the Journal of Korean Practical Arts Education Research, indicating a lower percentage compared to other journals. Moreover, the percentage of learning activities was high at 36.6% in the Journal of Korean Practical Arts Education Research, with the Journal of Korean Practical Arts Education (29.2%) showing that learning activities were relatively higher in education-related journals than others ($\chi^2 : 85.252, p < .001$, Fig. 3B). The composition ratio of horticultural activities varied among journals, but in most journals, cultivation and arts and crafts activities accounted for a majority of the overall programs in all the journals.

As a result of analyzing horticultural activities by authors’ major, it was found that authors majoring in education (40.4%) and multidisciplinary (41.7%) used cultivation activities the most, and authors majoring in horticulture (49.0%) and welfare (44.1%) used arts and crafts activities the most ($\chi^2 : 63.081, p < .001$, Fig. 3C). The fact that authors majoring in horticulture, who have conducted the most research on horticultural therapy, use arts and crafts activities more than cultivation is a point of concern. Arts and crafts activities are focused on producing outcomes, which means participants may not experience the process of growing plants. Thus, it is necessary to design programs with a higher ratio of cultivation activities that involve growing and tending plants, which is the essence of horticulture, than arts and crafts. This will enable continuous study on the interactions between humans and plants and enhance the value of horticultural activities (Relf, 1992).

Figure 3. The status of horticultural activities by analyzing 76 researches in Korean journals. A: overall, B: by journals ($\chi^2 : 85.252, p < .001$), C: by the major of authors ($\chi^2 : 63.081, p < .001$).
Moreover, plant observation is a way to visually recognize changes in plant growth. It helps to understand the process of reproduction, propagation, and growth by examining changes in plants and to realize subtle changes in nature. Through observation of plants, there is an increase in interest and curiosity toward plants, as well as a sense of achievement in obtaining new knowledge. These experiences positively influence their perception and attitude toward plants (Kim, 2015). Also, in children’s education curriculum, the importance of interaction with nature is emphasized by expanding nature inquiry and ecological education (MOE, 2023). Thus, it is necessary to help children with strong curiosity and an inquiring mind to understand nature and feel a sense of responsibility and achievement through cultivation and observation activities in which they can commune with plants. Furthermore, since play experiences can promote emotional development and enhance learning motivation for children (Moore, 1996), there is a need to develop and supplement cultivation and observation activities in horticultural activity programs that can stimulate children’s interest in living plants.

Analysis of plant species, types of usage and the relevance of horticultural activities

As a result of conducting a frequency analysis of the plant species used in horticultural activity programs for children, flowers were used the most (49.5%), followed by vegetables (19.4%) and no plants (13.5%) (Fig. 4A). Flowers were used the most because cultivation and arts and crafts activities, which account for a majority of horticultural activities, involved using flowers the most. In particular, the utilization of flowers in arts and crafts activities is high, accounting for 70.1% of their usage ($\chi^2 : 259.923, p < .001$, Fig. 4B). Vegetables were also used in high percentages for cooking (58.2%) and cultivation (38.4%) activities after flowers, but the percentages were less than half of flowers. The use of vegetables was insufficient because most activities were conducted indoors, making it difficult to secure outdoor space that can provide sufficient sunshine necessary for the healthy growth of crops. As the elementary practical arts education also emphasizes the importance of producing and ingredients selection, experiencing the entire process of growing plants, such as sowing, growing, and harvesting vegetables for human food, allows children to understand the food production process and realize the value of rural areas and agriculture. This can also help establish a proper value system regarding food so that they can have a positive impact on the formation of eating habits for children (MOE, 2023). Moreover, the diverse cultivation periods and harvest times for different crops provide a range of diversity in cultivation activities. Cultivating and harvesting vegetables that offer edible parts such as fruits, leaves, stems, and roots, are also effective in terms of ecological education by learning about plants through the five senses (RDA, 2023). Thus, it seems desirable to increase

Fig. 4. Classification of the plant species used in horticultural activities. A: overall, B: by activities ($\chi^2 : 259.923, p < .001$).
the use of vegetables in horticultural activity programs.

The percentage of not using plants or using artificial flowers in horticultural activity programs was relatively high (14.8%) because learning (38.5%) and other activities (73.5%) did not involve the use of plants. This may be because learning activities involve discussions and presentations, plant investigations, plant learning, and field trips, and other activities involve orientation, evaluations, and party activities that are carried out without plant materials. Direct involvement in nature is a valuable educational material (Moore, 1996), and horticultural activities, where plants and humans are the main factors, can be considered as educational activities that help children understand plants if activities involve actual cultivation, observation, and sensory experiences with plants, alongside learning activities.

Most of the types of plant usage were cut flowers (33.5%) and seedlings for transplanting (33.1%), whereas the harvest and collections from nature (16.0%) or seeds (10.8%) were relatively fewer (Fig. 5A). The high percentage of cut flowers was because of their extensive use in arts and crafts activities, accounting for 71.3% of such activities, while seedlings were mostly used for transplanting in cultivation activities (64.7%) ($\chi^2: 585.307, p < .001$, Fig. 5B). In cooking activities, more than half of the ingredients used were harvested and collected from nature (54.3%), while purchased fruits and vegetables from the market accounted for 28.4%. Using commercially available cut flowers in arts and crafts activities and purchasing fruits and vegetables from the market for cooking activities merely involve using plants as the materials for each activity, disregarding their therapeutic aspect (Choi et al., 2010). Thus, it seems difficult to define these activities as a concept of horticultural activities that involve taking care of plants. In learning activities, the harvest and collections from nature (51.3%) accounted for the biggest share because of activities such as collection and observation of plants. Seeds were used in less than 14% of each activity except for other activities, showing that they were used for germination in cultivation activities and for collages and observations in arts and crafts or other activities. It is necessary to increase the use of seeds in cultivation to experience continuous growth of plants from seeds to fruition. Furthermore, collecting seeds of plants that children cultivated themselves and sowing those seeds again will help provide an experience of plant regeneration.

As a result of examining whether plant names were indicated in the overall programs, 46.2% indicated the accurate plant name, 45.7% did not indicate the name, and 8.1% did not even specify the plant species. Accordingly, there was a higher percentage of uncertainty regarding the plants used in designing the horticultural activity programs (Fig. 6A), and especially in the case of herbs, 78.1% did not indicate the exact plant names ($\chi^2: 1256.069, p < .001$, Fig. 6B). Even though providing information about the species and specific names of plants is important for cognitive

![Fig. 5. Classification of the types of plant usage in horticultural activities. A: overall, B: by activities ($\chi^2: 585.307, p < .001$).]
functions and educational purpose in implementing horticultural therapy effectively, and composition of plants can influence the effectiveness of horticultural therapy (Relf, 1992), a majority of cases omitted accurate plant names. This omission reflects lack of awareness regarding the role and importance of plants in horticultural activity programs. Therefore, indicating accurate plant names will help select the appropriate plant species for program development in the future.

As a result of examining the frequency of plant usage according to the plant species in the articles that indicated specific plant names, it was found that 120 species of flowers, 51 species of vegetables, 8 species of herbs, and 8 species of fruits were used, with *Rosa hybrida, Lactuca sativa, Lavandula angustifolia,* and *Malus domestica* showing the highest frequency for each (Table 3). For flowers, *R. hybrida, Chrysanthemum morifolium, Dianthus caryophyllus,* and *Zoysia japonica* appeared in order. *R. hybrida, C. morifolium,* and *D. caryophyllus* were used in arts and crafts activities as cut flowers, and *Z. japonica* was mainly used in the form of grass dolls. The low frequency of using herbaceous flowers or potted flowers, which can be cultivated in pots or flower beds, indicates that there are insufficient cultivation activities in horticultural activity programs. For vegetables, *L. sativa, Raphanus sativus,* and *Brassica campestris* ssp., which are easy to grow and use, showed the highest frequency, followed by *Lycopersicon esculentum* which is known for producing fruits. For herbs, *L. angustifolia, Rosmarinus officinalis,* *Mentha ×piperita,* and *M. suaveolens* were used in order of frequency, showing that the generally preferred or well-known herbs for making herbal teas were mostly used. For fruits, *M. domestica* showed the highest frequency, followed by *Citrus sinensis, Musa paradisiaca,* and *Vitis* spp., which are easily obtained from the market to use in cooking activities such as making salads. To develop horticultural activity programs with a focus on cultivation or observation activities, it would be necessary to select suitable plant materials considering the level of difficulty in plant cultivation and the educational effects. Therefore, conducting research on the selection of plant species is necessary as well.

Table 3. Ranking the frequency of plants used in horticultural activities

<table>
<thead>
<tr>
<th>Rank</th>
<th>Flower (%)</th>
<th>Vegetable (%)</th>
<th>Herb (%)</th>
<th>Fruit (%)</th>
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<tbody>
<tr>
<td>1</td>
<td><em>Rosa hybrida</em> (11.5)</td>
<td><em>Lactuca sativa</em> (10.7)</td>
<td><em>Lavandula angustifolia</em> (32.1)</td>
<td><em>Malus domestica</em> (25.0)</td>
</tr>
<tr>
<td>2</td>
<td><em>Chrysanthemum morifolium</em> (8.3)</td>
<td><em>Raphanus sativus</em> (10.7)</td>
<td><em>Rosmarinus officinalis</em> (25.0)</td>
<td><em>Citrus sinensis</em> (18.8)</td>
</tr>
<tr>
<td>3</td>
<td><em>Dianthus caryophyllus</em> (4.7)</td>
<td><em>Brassica campestris</em> ssp. (10.1)</td>
<td><em>Mentha ×piperita</em> (10.7)</td>
<td><em>Musa paradisiaca</em> (18.8)</td>
</tr>
<tr>
<td>4</td>
<td><em>Zoysia japonica</em> (4.4)</td>
<td><em>Lycopersicon esculentum</em> (9.0)</td>
<td><em>Mentha suaveolens</em> (10.7)</td>
<td><em>Vitis</em> spp. (12.5)</td>
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Fig. 6. The status of whether to state plant names. A: overall, B: by the plant species ($\chi^2$: 1256.069, p < .001).
Analysis of plant sources

As a result of analyzing the sources of plants used in horticultural activities, purchase showed a high percentage at approximately 62-87% for flowers, vegetables, herbs, and fruits overall, indicating that plant materials used in horticultural activities were mostly obtained through purchase ($\chi^2 : 792.570, p < .001$, Fig. 7A). 87.0% of flowers used in cultivation and arts and crafts activities, which take up most of the horticultural activities, were obtained through purchase, and 62.7% of vegetables used in cooking activities were also obtained through purchase. As a result of analyzing sources by the types of plant usage, more than 94% of seedlings, cut flowers, and seeds were all obtained through purchase ($\chi^2 : 2028.215, p < .001$, Fig. 7B). For seedlings or seeds, which are used the most in cultivation activities, it is suitable to obtain them through purchase initially in order to grow plants. However, if cut flowers, which are the most commonly used in arts and crafts activities, are obtained through purchase, they cannot fulfill their roles as living organisms, making it no distinction from arts and crafts using non-living materials in the realm of art. Horticultural activities are differentiated from activities in other fields such as art and cooking because the participants can experience the growth cycle of living plants (Choi, 2003), reflect upon human life, and also learn emotional control, patience, and respect for life through taking care of plants (Suh et al., 2000). Thus, it is necessary to use the harvests of plants that participants have cultivated themselves into horticultural activity programs. This allows them to live a balanced life by satisfying their needs for nurturing and acquisition through the growth and harvest of plants (Matsuo, 2009).

Conclusion

This study analyzed the horticultural activities implemented in research articles on horticultural therapy for children in Korean journals as well as the plants used in the activities. The findings revealed that arts and crafts activities were the most commonly conducted overall, and the majority of plants used were obtained through purchase. Therefore, to emphasize the distinct benefits of horticultural therapy, it is necessary to increase the ratio of cultivation and observation activities where the participants can experience the plant growth process in designing horticultural activity programs. In addition, it is also necessary to redefine the essence and significance of horticulture and perceive plants as a critical element of horticultural activities by obtaining plants used as materials through actual cultivation, harvest, and collection from nature. Most horticultural activity programs for children are currently conducted indoors, resulting in limited space to carry out plant cultivation activities that require sufficient activity space, which is why most activities are focused on arts and crafts.

Fig. 7. The status of the sources of plants used in horticultural activities. A: by the plant species ($\chi^2 : 792.570, p < .001$), B: by the types of plant usage ($\chi^2 : 2028.215, p < .001$).
activities. Thus, in order to increase cultivation activities, it is necessary to secure facilities and tools that enable plant cultivation and diversify programs, allowing children to experience the growth of plants outdoors as well. Furthermore, to enhance the effectiveness of horticultural therapy, it is required to develop appropriate programs within designed period and provide enough time to experience plant growth. Also, the development and use of plant cultivation kits would be helpful in facilitating plant cultivation and observation activities smoothly (Moon et al., 2011).

This study has limitations in that it analyzed only the articles on horticultural therapy for children in Korean journals. Further research should include not only Korean but also international articles, as well as dissertations and research articles on various subjects, to continue conducting research on the trends of horticultural therapy. Moreover, to develop horticultural activity programs with a focus on cultivation and observation activities, it is necessary to study the difficulties of cultivation and the educational effects of various plant species, and select suitable plant species to enhance the effects of horticultural therapy.

References


