

The Study of the Relevance of Science and Art in the Renaissance Based on a Botanical Perspective

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Abstract. In the past, research on botany during the Renaissance focused more on science, mainly on the background of the birth of botany, the role of scientific development in its advancement and subsequent development during the Renaissance. However, there is still a gap in research from an artistic perspective and the connection between botany and art. This article mainly focuses on the botanical paintings of the Renaissance period and the herbal history books before and after that period, analyzing the connection between science and art from a botanical perspective. This study compares the similarities and differences of plant paintings from different periods of the Renaissance through horizontal and vertical comparisons and combines the plant culture and naturalism of that period to interpret the connotations and symbols of plant elements in painting. Research has shown that the advancement of plant painting forms has promoted the development of plant science research, which further promotes the widespread application and deepening of plant elements in artistic works. Studies have shown that science and art in the Renaissance period mutually influenced and developed, forming a virtuous cycle.

Keywords: Renaissance, Botanical, Herbalism, Painting, Arts & Sciences.

1. Introduction

The study of the scientific development of the Renaissance from a botanical perspective is one of the key research topics in the academic world at present, and the study of botany and the development of the arts in the Renaissance, although there are a lot of research results, but lack of systematic categorization. 1912 Agnes Alber, a botanical woman academician of the Royal Society, published her work, *The Origin and Evolution of the Botanical Prehistory of the European Herbs: 1470-1670*, which is a classic work on the development of early European botany and herbs in print and publication. "It is a classic study of early European botany and the history of the development of herbal printing and publishing, the main purpose of this book is to trace the evolution of European printed herbalism between the 15th and 18th centuries, its foothold is two, firstly, botanical, and secondly, art." [1]. It can be said to be the first epoch-making study linking botany and art. In 2016, Santiago Berruet, a Spanish Doctor of Philosophy, conducted a comprehensive analytical study of the scientific, philosophical, aesthetic, and architectural-artistic values of Renaissance botanical gardens in his work "*Philosophy in the Garden*" [2]. Oxford University Herbarium Stephen Harris, curator of the Oxford University Herbarium, published his work *Planting Paradise Cultivating the Garden 1501-1900* in 2022, which explored the development of botany from the 16th to 19th centuries, and at the same time, sorted out the past European botanical cultures, botanical mysticism, myths, as well as the value of medicinal uses [3]. From the above categorization, it is easy to see that although the research on the connection between botany and the development of Renaissance art has a wide range of contents, including art, aesthetics, philosophy, literature, etc., it lacks a systematic categorization, and there are few research focusing on the Renaissance as a specific period of time. At the same time, there is also a lack of specialized and systematic research on the connection between botanical elements and botany, which are widely found in Renaissance paintings.

Therefore, on the basis of reference to existing studies, this paper focuses on the botanical elements in Renaissance paintings and related botanical sketches to analyze the connection between science and art from a botanical perspective. This study firstly analyzes the progress of botany in this period by collecting plant paintings before the Renaissance and in the middle of the Renaissance, comparing

the differences in painting styles between the two, and observing the changes in the styles and contents of plant paintings; at the same time, combining with the plant culture and the naturalistic ideas of this period, it interprets the cultural connotations and symbolic significance of the plant elements in the paintings, and analyzes the impact of the botanical development on the art paintings.

2. Method

This paper takes a large number of paintings containing botanical elements in the Renaissance period as the object of study, which are categorized into two main groups according to time: the Pre-Renaissance (including the early Renaissance) and the Middle and Late Renaissance. Pre-Renaissance and Early Renaissance botanical paintings are mainly illustrations for medieval books on botany and plant effects, such as *Tacuinum Sanitatis* (1100s), *Tractatus de Herbis* (1400s), while works from the Middle and Late Renaissance include 16th-century botanical sketches by Leonardo da Vinci and Dürer's related paintings, sketches and related paintings by Dürer. These paintings are categorized by their content into three main groups: paintings, drawings (sketches), and illustrations. The sketches, on the other hand, are realistic sketches of plants, such as Leonardo da Vinci's '*Study of plants*'. The illustrations are mainly derived from botanical illustrations in various Renaissance Garden and apothecary illustrated books, such as *Tractatus de Herbis*, *Tacuinum Sanitatis*, and selections from relevant reading literature, such as *Herbals, Their Origin and Evolution, A Chapter in the History of Botany, 1470-1670*.

The research methodology of this paper focuses on comparisons and analogies. In time, we compare the difference in style and the degree of realism between botanical paintings of the medieval period and the early Renaissance, observe the trend of change in the artistic style of botanical paintings, and analyze the reasons for the changes by comparing the related works of the same period horizontally with the scientific, cultural, and social backgrounds of the different periods of history, so as to decipher the correlation between botanical development and botanical paintings. In the process of analogy, the plants appearing in the paintings are analyzed, and the botanical culture and symbolic meanings represented in the paintings are interpreted in the context of the relevant times, religions and cultures.

In this study, the strength of the research method lies in the combination of horizontal and vertical comparisons, the selection of materials is refined, and according to the category of the work, the time of creation, and the content of the subject matter, it is reasonably categorized and organized in the study, and then compared. In addition, the sources of the selected paintings contain works of botanical-related knowledge from different periods, which are closely related to the theme of the study. At the same time, the strength of the research process of this study lies in its informative nature. The research process and results are also judged for reasonableness while the research is analyzed. The method lies in the fact that, on the basis of the previous research, referring to its research method and logic, comparing with one's own process, and correcting the research results to a certain extent, thus guaranteeing the reliability and rationality of the research results, and enhancing the persuasiveness of the research process and the research results.

3. Results

By comparing the drawing of Mandrake in Figure 1, the Pseudo-Apuleius Herbal Journal of the 9th century A.D., and Figure 2 and The Garden of Health Translated from Latin into French, published in the late 15th and early 16th centuries, it can be seen that from the Middle Ages to the Pre-Renaissance, people's disciplinary cognition of the plant was very vague, and the cognition of the plant originated from a large number of folklore and religious myths that had been transmitted by word of mouth since the Middle Ages, and the drawing of the Mandrake was a good example of how the plant was used in the Middle Ages. Legends and religious myths, drawings are also full of wild

imagination, and the composition is symmetrical, mechanical, similarly to the pattern, with the unique artistic style of medieval painting [4].

Comparing the illustrations Figure 3 and Figure 4 in *The grete herball*, which enjoyed great fame in the middle of the 16th century, it can be seen that by the middle of the Renaissance in the 16th century, the situation of botanical drawings in the herbals had been significantly improved, compared with the previous to a certain extent reduced the composition of *The grete herball*, and more inclined to the physical sketches, and the content has a large number of Greek mythology and Christianity components. Christianity, proving that early Renaissance botanical paintings were a continuation and development of medieval style and content [5].

Into the 16th century, the Renaissance reached its heyday, plant painting into the nature and the pursuit of the real stage, and began to appear in a wide range of artistic paintings. During this period, the garden boom, botanical gardens from the medieval manor of agricultural production elements, to meet the aesthetic and spiritual needs of mankind and the existence of the first Spanish-language horticultural monograph in 1592, *Agricultura de jardines*, the basis of the description of the plants is the value of its decorative and aesthetic interest to describe them [2]. This initiative to give spiritual meaning to beauty was an important symbol of European art in the 16th century, and had a significant impact on artists such as Botticelli, Da Vinci, and Dürer, while the establishment of gardens and the popularity of naturalistic ideas provided them with a good opportunity to observe and sketch plants [2]. Leonardo da Vinci blended scientific precision with artistic sensibility, and utilized his superior sketching skills to make a large number of botanical sketches, such as the various types of flowers and plants in Figure 5. In addition, he also applied his botanical sketches to paintings, such as Figure 6, "The Annunciation," in which the various wildflowers in the meadow in the lower part of the picture are portrayed with exceptional delicacy and clarity, and it is possible to distinguish sage, daisy, iris, rue, and other native Italian plants commonly found in Renaissance gardens [5].

Albrecht Dürer, on the other hand, used a large number of botanical drawings in his paintings, and in his masterpiece *Large Piece of Turf* (1503) (Figure 7), which is considered to be the first ecological study, he depicted the roots, stems, and blades of plants in great detail [6]. By comparing the two versions of Dürer's *Adam and Eva*, it can be seen that in Figure 8, the leaves of the Tree of Life are clearly stipule ovate-lanceolate and densely packed, so it can be deduced that this is a fig tree rather than an apple tree. However, the shape of the fruits is very similar to that of apples, which belongs to the "hybridization" of the Tree of Knowledge that was common at that time, while the fruit form is very similar to that of an apple, a common "hybrid" depiction of the tree of knowledge at the time. As described in Genesis 3:7, "Then he took the leaves of the fig tree and wove a skirt for himself." [7]. However, in the later version of Figure 9, the shape of the leaves is changed to oval, pointed at the front and broadly rounded at the base, with serrated edges, typical of apple leaves, with a thick and solitary trunk, which is distinctly different from the botanical properties of the copperplate engraving, and a comparison of the proportion of Eve's hands and fruits reveals that the fruits in Figure 9 are also larger than those in Figure 8, which demonstrates the author's rigor and scientific rigor in his drawing [8].

Comparison of the mid to late 16th century plant illustrated books, can be seen that the paintings are not only more realistic sketching, attention to detail, but also has artistic appreciation value, and promote the prosperity of plant culture. For example, Otto Brunfels' *Herbarum vivae eicones* of 1530 (Figure 10), painted by Hans Weiditz, is so extremely realistic and beautiful in its botanical imagery that its work is often mistaken for Dürer [8]. Fox's *De Historia Stirpium* (1542) (Figure 11) in which plants were outlined and then colored, made hand-drawn illustrations an early form of introduction to the book trade and profoundly influenced later botanical art [8]. The Dutch flower merchant Emanuel Sweerts (1561-1629), whose *Hortus Eystettensis* (Figure 12) published in 1612 and depicting more than 300 bulbs and 240 flowering plants, attracted widespread attention, is credited with kicking off the tulip craze in the Netherlands in the mid-17th century [9].



Figure 1. The Mandela grass in manuscript of The Herbal of Pseudo-Apuleius [10]



Figure 2. The mandela grass in Ortus Sanitatus Translate de Latin en Francois [11]



Figure 3. The Grete Herball (1526) sig. ✕1r [12]

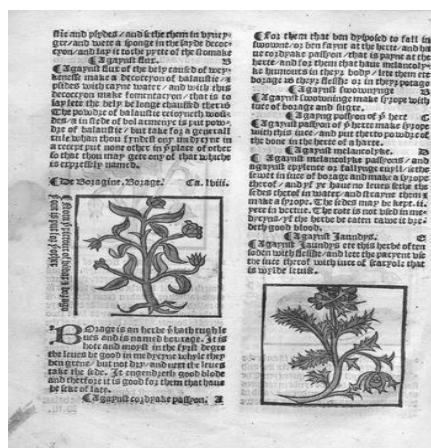


Figure 4. The Grete Herball (1526) sig. D3v [12]

4. Discussion

From the Middle Ages to the Pre-Renaissance, when botany had not yet been born, the study of plants and the compilation of herbals followed the medieval superstitions and the depictions of plant illustrations mostly adhered to the stereotypes of codices and drawings [1]. During the Renaissance, however, with the development of humanistic and naturalistic ideas and the maturation of artists' realistic painting skills, various plants were able to be truly depicted and documented in realistic paintings. "The Renaissance love of clear and accurate images ultimately remedied the shortcomings of the earlier fascination with verbal writing. These clear and accurate works of art were even better models for subsequent works of botanical research." [13]. The advancement of realistic botanical painting laid a solid foundation for the birth of botany as a scientific discipline, while the concept of botany continued to take shape, and the development of botanical research during the Renaissance contributed to the flourishing of botanical culture, and under the influence of the humanist and naturalist ideas and the garden architecture craze of the period, led to its massive application in works of art. Thus, it can be seen that under the botanical perspective, science and art in the Renaissance influenced each other's development and formed a virtuous circle.

In the process of horizontal and vertical comparison in this study, the selection of paintings is as analogous as possible to the works of different writers in the same place during the same period, but due to the differences in the painting styles of different painters and their personal artistic ideas, and due to the fact that there is a controversy over the time of the source of some of the works, such as the copying and reprinting of the illustrations of the various herbs due to the version of the translations and transcriptions, and that some of the painters have a lack of information on their life and are difficult to prove the influence of their life experience and the relevant experiences on the style of their works. The lack of information on the life of some painters makes it difficult to confirm the influence of their life experience and related experiences on the styles of their works, and therefore, the conclusions drawn from the analogies of different paintings still have limitations. Therefore, the conclusion drawn from the analogy of different paintings still has its limitations. Subsequent studies can take this as a point of improvement, and further screen the sources of paintings from different periods in order to improve the accuracy of the research results.



Figure 5. Leonardo da Vinci. Study of plants. 1506 [14]



Figure 6. The Annunciation, Leonardo da Vinci c. 1472–1476 [15]



Figure 7. Large Piece of Turf (1503) [16]



Figure 8. Adam and Eve, 1504 [17]



Figure 9. Adam and Eve, 1507 [18]



Figure 10. Pasque Flower (*Anemone pulsatilla*) from Brunfels Herbarum vivae icones, Johann Schott Strassburg, 1530 [19]

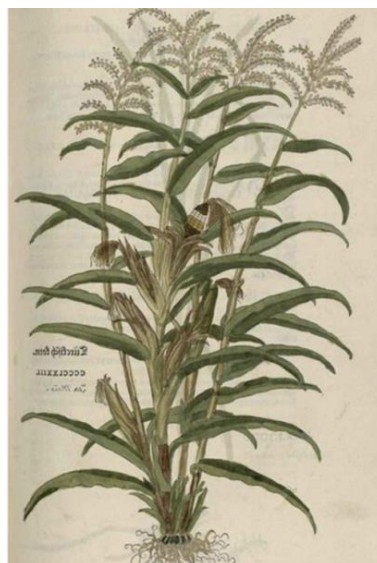


Figure 11. Corn from Fuchs New Kreuterbuch, Michael Isingrin, Basel 1543 [20]



Figure 12. Gladiolus from Florilegium, Emanuel Sweerts, Frankfurt a.M.1612 [21]

5. Conclusion

During the Renaissance, the scientific research and painting of plants inherited from the Middle Ages made new development and progress. Humanism and naturalism's pursuit and worship of the true beauty of nature, as well as a new type of ornamental botanical gardens derived from the medieval manor houses of Western Europe, gave artists the opportunity to conduct fieldwork, sketch plants and integrate them into the creation of artistic paintings, so that the cultural and symbolic meanings, related medicinal uses and scientific and technological uses of plants were recognized. Symbolism, medicinal and scientific values of plants also began to be emphasized, and botanical science also made great progress in the process. The progress in the form of botanical paintings and the enhancement of aesthetic value, artistry and ornamental properties are conducive to the enhancement of botanical research and the prosperity of social plant culture, further promoting the development of botanical scientific research, while the latter can further promote the wide application of botanical elements in art works and deepen their connotations, thus forming a benign cycle of mutual influence between science and art. From the perspective of botany, plant culture is the construction of human spiritual world based on the natural life of plants; from the perspective of social science, plant culture is the ecological reproduction of human spiritual life in real society. This study not only makes up for the gap between the scientific and artistic research of the Renaissance, but also promotes the development of interdisciplinary research in botany, medicine, fine arts, philosophy and other specialties, and further improves the theoretical system of the research on plant culture and artistic creation, which is conducive to the creation of related literary works.

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