Relationships between aroma component composition of herbs and its aromachology effects

-Abstract version-

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Abstract

Aromachology was defined as a science based on the study of the psychological effects of fragrances, especially increasing hedonic qualities, on behavior and mental states. As aromachology attracts attention as complementary and alternative medicine, it is necessary to accumulate scientific evidences, although they have not been sufficiently evaluated. The aim of this study is to establish the scientific evaluation methodology of aromachology and to understand the relationships between aromachology effects on human and volatile component compositions of common herbs.

In Chapter 1-1, the methodology of aromachology effect evaluation was constructed. Then, the aromachology effects on the human autonomic nervous system by lavender aroma inhalations were also investigated. The inhalation of true lavender essential oil induced more sedative effects than that of lavandin oils. From the data by GC-FID and GC-MS, it was shown that lavandin oil contained a much higher amount of camphor than true lavender oil. These results suggest that different volatile component compositions of essential oils may have different aromachology effects on human.

In Chapter 1-2, further investigation was carried out by using 27 commercial *Lavandula* essential oils. We analyzed their volatile component compositions by means of GC-FID and GC-MS. The volatile component composition of the essential oil was categorized by PCA, and seven essential oils were selected for the aromachological evaluation. Some lavender essential oils exhibited a sedative effect on humans and the others did not. It was also shown that linalyl acetate and camphor were the major active

components for the aromachology effects on human.

In Chapter 2, factors affecting the volatile component composition of extracts of rosemary were analyzed. Aromachology effects on human of rosemary extracts were also evaluated. At first, essential oils and hydrosols were extracted from rosemary harvested in different seasons, and the chemical compositions of volatile component in the two fractions were analyzed by GC-MS in Chapter 2-1. Enantiomers of some volatile components were also analyzed by enantioselective GC-MS. The main components of the rosemary essential oils were eucalyptol and α-pinene, while camphor, borneol, and eucalyptol were predominant in the hydrosols. Classification of volatile components based on chemical groups revealed that essential oils contained high levels of monoterpene hydrocarbons but hydrosols included oxygenated monoterpenes as a major volatile component. The difference in the main volatile components between rosemary essential oils and hydrosols suggests the different biological functions of the two fractions. Enantioselective GC-MS analysis revealed that the enantiomeric distribution of volatile components do not differ between essential oils and hydrosols, or seasons.

In Chapter 2-2, it was shown that volatile components differed by the varieties. Enantiomeric distribution also differed by the variety. Two rosemary varieties which possess different volatile component compositions were selected, and their essential oils and hydrosols were examined for the aromachology measurement. As a result, no clear physiological effect was demonstrated in all the rosemary samples. Only the hydrosol sample of 'Santa Barbara' showed the positive effects on human mind. These indicate that volatile component compositions of rosemary samples differ by varieties and types

of extraction (essential oil or hydrosol), rather than the seasons. Aromachology effects of rosemary samples were not always the same.

In Chapter 3-1, physiological and psychological effects of 'Wishing' rose fresh flowers and their hydrosols on humans were evaluated. R–R power spectral analysis of heart beats revealed the sedative effects of volatiles from fresh flowers. This result supports the data reported previously. On the other hand, the stimulus effects of hydrosols were also confirmed. These results demonstrate that fresh rose flowers may be the alternative to rose essential oils, whereas hydrosols may have another use. A new use of fresh rose flowers is also proposed for the aromatherapy or phytotherapy.

In Chapter 3-2, volatile emission of rose extracts enfleurage, an extraction method of floral scents with the help of lipophilic carrier, and their psychological and physiological effects on human were evaluated. Rose varieties 'Yves Piaget', 'M-Marie Antoinette' and 'Caffè Latte' were applied to the experiments. Analysis of volatile component composition by means of HS-SPME-GC revealed that *cis*-3-hexenyl acetate, 3,5-dimethoxytoluene and *p*-vinyl anithole were major components of 'Yves Piaget', 'M-Marie Antoinette' and 'Caffè Latte' fresh flowers, respectively. On the other hand, percentages of phenolic volatiles, reported as key components of rose characteristic notes, were predominantly contained in all the enfleurage extracts. Psychological and physiological evaluation revealed the stimulus effects of enfleurage extract of 'M-Marie Antoinette' on human and anti-fatigue effects of 'Yves Piaget' enfleurage extract. These indicate that rose enfleurage extracts possess psychological and physiological effects on human, although the effects may be different among varieties. The enfleurage extracts

might be the alternative source of rose fresh flowers in aromatherapy.

In this study, aromachology evaluation methodology, based on the scientific tools, was constructed. Then, the factors, which affect the volatile component compositions, together with enantiomers, were investigated. All the present results indicate that several factors influence the volatile component composition, thereby causing aromachology effects on human. Information about aromachology effects is very confused in the present aromatherapy field. Our methodology may contribute to the improvement of the current status and enhance the use of aromachology as CAM.