

铜、锌、硒对药用菊花主要有效成分和花中硒含量的影响

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Effects of Cu, Zn and Se on contents of total flavonoid, chlorogenic acid and Se in the flower of *Chrysanthemum morifolium* Ramat.

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摘要 采用3因子5水平3512最优回归设计的盆栽试验, 研究铜、锌、硒3元素对药用菊花主要有效成分(总黄酮、绿原酸)和花中硒含量的影响。结果表明, 在满足其它大、中、微量元素需求条件下, 施用铜、锌、硒三种元素对菊花花中的有效成分表现出交互作用。其中, 铜、硒配施表现出正效应, 并达到显著水平; 而铜、锌和锌、硒配施则显示负效应。高水平的铜对菊花生长和有效成分的生成产生严重抑制作用甚或毒害作用。锌是影响菊花内在品质的重要微量元素养分, 对提高菊花花中的总黄酮、绿原酸含量的作用显著; 缺锌条件下, 菊花总黄酮和绿原酸的生成和累积受到阻碍。铜、锌、硒3元素对菊花花中有效成分的影响机理需进一步研究。菊花花中的硒含量与硒的施入数量之间存在正相关关系, 而不受铜、锌元素配施量的影响。

关键词: 药用菊花 铜锌硒配施 总黄酮 绿原酸 硒含量 药用菊花 铜锌硒配施 总黄酮 绿原酸 硒含量**Abstract:**

Using the 3512 optimum regression design with three factors and five levels, effects of applications of Cu, Zn and Se on contents of main active constituents (total flavonoid and chlorogenic acids) and selenium in the flower of *Chrysanthemum morifolium* were investigated by a pot experiment. The results show that applying Cu, Zn and Se with enough other macro and medium and trace elements is able to increase contents of total flavonoid and chlorogenic acids in the flower of *Chrysanthemum morifolium* significantly, and the interaction of the three elements also reacts to the influence on the active constituents: contents of total flavonoid and chlorogenic acids are increased significantly under the Cu-Se interaction, however, the contents are decreased under the Cu-Zn and Zn-Se interactions. Higher concentrations of Cu have inhibition or even toxicity effects on the crop growth and the main active constituents. The formation and accumulation of the two main active constituents are restrained under Zn deficiency, and Zn is a dominant nutrient factor of affecting quality of *Chrysanthemum morifolium*. The effect mechanism of Cu, Zn and Se on the active constituents should be further studied. There is significant positive correlation between selenium content of the flowers and Se application amount. The selenium content of the flowers is not able to be influenced by the application of Cu and Zn. This result provides theoretical basis for developing Se enriched *Chrysanthemum morifolium* Ramat and its series products.

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