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山核桃属种间嫁接亲和性分析

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摘 要:【**目的**】对山核桃属种间嫁接亲和性进行探讨分析,为嫁接砧穗的选择提供理论依据。【**方法**】以山核桃、薄壳山核桃、湖南山核桃2 a(年)生实生苗为砧木,分别与山核桃、薄壳山核桃、湖南山核桃当年生优良穗条嫁接,形成9个砧穗组合,通过萌芽率、成活率、生长指标、光响应曲线和荧光参数等指标综合评价嫁接亲和性。【**结果**】(1)以湖南山核桃和薄壳山核桃为砧木时,接穗萌芽率最高,分别为80.26%和78.52%,以湖南山核桃为砧木嫁接山核桃萌芽率提高了12%。(2)从嫁接苗的生长量来看,薄壳山核桃不宜嫁接在山核桃和湖南山核桃砧木上;而当以薄壳山核桃为砧木时,能促进山核桃和湖南山核桃的生长;湖南山核桃为砧木,能促进山核桃接穗粗度增加。(3)从光合指标来看,以薄壳山核桃为砧木的A_{max}显著高于以山核桃和湖南山核桃为砧木的苗木。LSP以薄壳山核桃为砧木时最高,从一定程度上可以表明在相同光照条件下,LSP较高的叶片不易光抑制,湖南山核桃嫁接在山核桃上能增强叶片的LSP,增强其抗光抑制能力。(4)薄壳山核桃为砧木、薄壳山核桃为接穗的嫁接苗栅栏组织最厚(145.665 μm),植物利用光能的效率最高,也相应的使山核桃和湖南山核桃接穗的嫁接苗栅栏组织变厚。【**结论**】山核桃和湖南山核桃亲和性良好,以薄壳山核桃为砧木分别嫁接山核桃和湖南山核桃亲和性好,但分别以山核桃和湖南山核桃为砧木嫁接薄壳山核桃的亲和性差。

关键词:山核桃;亲和性;响应曲线;叶绿素荧光

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A study of grafting compatibility in *Carya*

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Abstract:【Objective】The seeds of *Carya* Nutt. are the economic organs in species of this genus. Grafting is a breakthrough in propagation of the crop, and grafting compatibility is the crucial factor determining grafting success. The study examined the grafting compatibility among species in *Carya* Nutt. in order to select suitable grafting rootstocks and improve the success of grafting.【Methods】Three different *Carya* Nutt. species (*Carya cathyensis, C. hunanensis* Cheng et R. H Chang ex Chang et Lu, and *C. illinoensis* K. Koch) were used as rootstocks to graft with three different scion species (*C. cathyensis* Sarg, *C. hunanensis* Cheng et R. H Chang ex Chang et Lu, and *C. illinoensis* K. Koch). The grafting compatibility was judged by survival percentage, and the properties of grafted trees including the light response curve of photosynthesis and chlorophyll fluorescence parameters were analyzed. Grafting was carried out in the mid April, 2014. Budding scion sticks and surviving grafted plants were counted in the mid May, and shoot length and diameter were measured after leaf shed in November. On a sunny day in August, light response of pho-

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tosynthesis was measured using a LI-6400 portable photosynthesis system with an automatic light curve procedure at 8:30-11:30. Light saturation point (LSP), maximum net photosynthetic rate (P_{max}), light compensation point (LCP) and dark respiration rate (R_d) were obtained from the regressed light-photosynthetic rate curves. In one morning in September, a portable modulated chlorophyll fluorescence spectrometer (PAM-2500, Walz, Germany) was used to measure the chlorophyll fluorescence parameters of mature leaves, including the fast light response curve and the relative electron transfer rate. The measurements were carried out with 3 to 5 replicates (one leaf each from 3 to 5 plants). To measure the specific weight of the leaves, 5 leaf discs 0.9 cm in diameter were punched out from both sides of the midrib, killed out at 120 ℃ for 30 min, dried at 80 ℃ for 24 h, and weighed for dry weight with an electronic balance. In the late August, mature leaves at the middle and lower positions of new shoots were collected and 0.5 m^2 leaf slices were cut from both sides along the central vein with a sharp blade and fixed with FAA. After dehydration with a series of concentrations of alcohol, the leaf slices were dipped in wax for sample embedding. Sections of 10 μm were cut with a rotary microtome (BCQ-202), double stained with Safranine-Fast Green, sealed with neutral gum, and observed under a microscope. Leaf thickness and the thickness of the palisade and the spongy tissues were measured at different locations.【Results】When *C. hunanensis* and *C. illinoensis* were used a rootstocks, budding rate of the scion sticks was the highest, being 80.26% and 78.52%, respectively. *C. hunanensis* as rootstock increased the budding rate of *C. cathyensis* scion by 12%. When scion growth was considered, *C. illinoensis* should not be grafted onto *C. cathyensis* and *C. hunanensis*. *C. illinoensis* as rootstock promoted the growth of *C. cathyensis* and *C. hunanensis*. The Amax in plants grafted on *C. illinoensis* was significantly higher than in those grafted on *C. cathyensis* and *C. hunanensis*. The LSP in *C. illinoensis* stocked plants were the highest. *C. hunanensis* grafted on *C. cathyensis* had a higher LSP. LSP were generally higher in *C. cathyensis* than in the other scions. The LSP in plants grafted on *C. illinoensis* rootstock was the highest. *C. hunanensis* grafted on *C. cathyensis* increased LSP. Self-rooted *C. illinoensis* plants had a thick (145.665 μm) palisade tissue and thus a high light energy efficiency. *C. illinoensis* as rootstock also increased the thickness of palisade tissue in *C. cathyensis* and *C. hunanensis* scions.【Conclusion】*C. cathyensis* and *C. hunanensis* had the best grafting compatibility among the tested rootstock-scion combinations. *C. illinoensis* as rootstock had also a good grafting compatibility with C. *cathyensis* and *C. hunanensis*, while *C. cathyensis* and *C. hunanensis* as rootstock had a poor grafting compatibility with *C. illinoensis*.

Key words: *Carya cathyensis* Sarg; Grafting compatibility; Response curve; Chlorophyll fluorescence

山核桃属植物用途广泛，可作为油料和用材树种，且果实具有较高的营养价值[1]，约18个种，主要分布在北美东部和亚洲东南部，属内的山核桃（*Carya cathyensis* Sarg，又名浙江山核桃）、湖南山核桃（*C. hunanensis* Cheng ）、薄壳山核桃（*C. illinoensis* Koch）经济价值高，经济效益好[2-3]。嫁接核心技术取得进展后，发现当以山核桃自身作为砧木时，嫁接成活率明显偏低，而且造林成活率也不高。山核桃属嫁接在前期生长良好，但在结果后易出现不亲和现象，如种子变小、产量下降等，不利于广泛使用[4]。薄壳山核桃起苗后根系不易恢复，多采取室外立苗嫁接。因此仍需深入研究有关嫁接亲和性的问题。嫁接亲和性的机制较为复杂，受解剖结构和生理生化特性的影响，由众多因素控制，如酶、激素、酚类物质等[5-6]，是遗传物质表达的结果。

张武等[7]为了提高云南枣树嫁接成活率并促进枣树嫁接技术在云南的推广，对影响枣类嫁接成活的因素以及嫁接成活的关键技术进行研究，并对嫁