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THE INFLUENCE OF VARIED STEM MATURITY ON ROOTING OF CARIBBEAN OREGANO (*Lippia micromera* S.)

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ABSTRACT

Different stages of vegetative maturity influence rooting potential of stem cuttings. Oregano is in high demand in the international herb market. Four experiments were conducted in spring and fall of 1990 and 1991 to: 1) determine optimum stem maturity stage for cutting propagation of Caribbean oregano (*Lippia micromera* S.), and 2) determine seasonal differences in its rooting capabilities. Hardwood main stems, hardwood secondary stems, softwood stem tips, and semi-hardwood stem tips were placed upright in perlite using a hotbed. Bottom heat temperature was 28°C for all exp. At 21 days, shoot growth (SG), and root length (RL) ratings and rooting percent data showed highly significant difference between stem cuttings. Softwood stem tips gave plants with the best shoot growth and root system regardless of the season. Increased wood maturity negatively influenced rooting potential for fall propagated cuttings.

INTRODUCTION

Caribbean oregano (*Lippia micromera* S.) belongs to the family Verbenaceas. There are 760 species in this family, mainly in temperate and tropical climates. Liogier (1974) considered Caribbean oregano to be original from the Antilles. It can be described as a bush type plant of 1-2 m high, perenne, highly branched, small oval leaves of 6-12 cm, and white or pink flowers in terminal bunch. Rodriguez (1980) listed the uses of this oregano in the antilles. Fresh and dry leaves are used as seasoning. Medicinal properties are attributed to its volatile essential oils. The te is used as astringent, as antiseptic, to cure dysentery and against cold.

Tucker (1990) reports that almost every culture of the temperate and tropical zones utilizes plants high in phenol carvacrol and often these plants are substituted for each other. There is the need to understand the name oregano as a particular spice flavor, and not to refer to any one particular species. When considering the commercial value of the different oreganos, the Caribbean oregano is highly appreciated. The plant propagates both by seeds and stem cuttings. Seed germination is low, having the seedlings a long juvenile stage and great genetic segregation. Stem cuttings has been used for long time in the Caribbean. However, Rodriguez (1980) reports poor rooting results. Because of the highly branched growing habit, there are always tips and branches of different maturity and under different growing conditions.

When propagating perennials by cuttings the type of plant material to be selected at different seasons is an important consideration. Raviv et al. (1983) found that winter cuttings of laurel taken from lower and juvenile parts rooted better than those taken from older parts. During the summer rooting differences were not significant. This changes in rooting ability with season and stage of growth can be related to dormancy and/or change in the balance between rooting promoters and inhibitors. Hartman and Kester (1983) concluded that during dormancy rooting is generally poor.

Moe (1988) claims, seasonal variations in rooting may be related to changes in irradiance level, light quality and photoperiod. Short days induce dormancy in many species and flowering in short day plants generally inhibit rooting and lateral branching. Long days induce flowering in long day plants (LDP) inhibiting rooting and lateral branching. Temperature can modify the effect of photoperiod and/or irradiance on lateral branching and rooting.

Heide (1968) demonstrated that mother plants grown at high temperature and long days (LD), a combination which is favorable for rooting of its cuttings, had a higher auxin activity than those from SD and low temperature. Therefore, cuttings should be obtained from healthy, turgid, disease and insect-free stock plants with no nutritional deficiencies.

According to Rak and Nowak (1988) for snapdragon which seedlings possess a long and vulnerable juvenile stage, cuttings propagation omits that first very critical stage of seedling growth. Van de Pol and Van Hell (1988) considered a clear sample the Musaceas, which propagation by seeds is undesirable due to a prolonged period of juvenility of about 4 years and a great degree of genetic variation.

There is an optimum range of environmental conditions for propagation to ensure good rooting results. Loach (1988) emphasized the propagation environment is controlled through use of shading, polyethylene enclosures, variation of the misting frequency, humidification and temperature regulation through heating or evaporative cooling. It is adequate to mention that optimal conditions are often specified in terms of the individual environmental components in an specify location.

As specified by Moe (1988) the goal of all plant propagator is to obtain high quality young plants in the shortest possible time. This implies that cuttings must root quickly and be capable of forming adventitious buds, good lateral branching and fast subsequent growth after rooting. That is why it is so important to know the best wood-hardiness of the stems for cuttings propagation.

The objectives of this research were defined as follow: 1) determine optimum stem maturity stage for cutting propagation of Caribbean oregano, and 2) determine any difference in the rooting capabilities of Caribbean oregano during spring and fall propagation seasons.

MATERIALS AND METHODS

Four rooting experiments were conducted during the spring (May) and fall (September) of 1990, and during the spring (April) and fall (September) of 1991 using Caribbean oregano stem cuttings at different vegetative maturity. Randomized complete block designs with four replications were used. The treatments (trt) under consideration were the following: 1) hardwood main stems, 2) hardwood secondary stems, 3) softwood stem tips, and 4) semi-hardwood stem tips.

Cuttings from clonally propagated mother plants were separated based on mentioned wood hardiness treatments and surface disinfected with a 5% solution of chlorine. Leaves were removed from the basal 2.5 cm of the cuttings. While wet, the basal end of the cuttings were dipped into hormodin No 1 (1 % of Indole-3-butyric Acid) root inducing substance.

The experiments were conducted in a glass greenhouse with 50 % shading. The rooting media was horticultural perlite on a hotbed. Temperature (T) and relative humidity (R.H.) in the greenhouse and in the hotbed were kept constant for the four experiments. Temperature in the hotbed was set at 28° C . Diurnal T in the greenhouse fluctuate from 26 to 29°C, while night T fluctuate from 20 to 26°C. Adequate moisture was maintained by misting irrigation when necessary according with a moisture detector placed in the middle of the experiments. Efforts were made to keep environmental conditions constant during rooting.

After 21 days, cuttings were taken out and rooting data recorded. The data collected included ratings of shoot growth (SG), and root length (RL) in an scale of 1 to 5 (5 = the best) and rooting percentage (R %). Statistical analyses included, two way analysis of variance (ANOVA) and mean separation by least significant difference test (LSD).

RESULTS

Results of the four rooting experiments will be commented independently. Also, similarities and differences in the performance of treatments due to seasonal and environmental variations will be evaluated.

In experiment # 1 (May, 1990) SG and RL ratings were highly significant affected by the treatments. Softwood stem tips had the quickest shoot growth among all treatments and no differences were observed between hardwood secondary stems, hardwood main stem, and semi-hardwood stem tips (Table 1). Rooting percentage did not showed significant difference among treatments. However, there was a trend of softwood stem tips having the best root system.

In experiment # 2 (September, 1990) SG, RL, and R % showed highly significant differences among treatments. Softwood stem tips had the quickest shoot growth, the strongest root system, and the greatest rooting percentage among all treatments (Table 2). Semi-hardwood stem tips, hardwood secondary stems and hardwood main stems followed in that order for the three variables under evaluation. The order in which these treatments followed each other is different from experiment # 1. During the fall the efficiency of the cuttings seems to be more closely related to the tenderness of the tissue, the more tender the better they root. From this preliminary results, it appears that a dormancy mechanism in this tropical plant shows low hormonal activity during the fall. If this is true, the rooting capabilities will be reduced as the tissue matures.

In experiment # 3 (April, 1991) SG and R % showed a highly significant difference among treatments. Softwood stem tips had the quickest shoot growth and the greatest rooting percentage among all treatments (Table 3). Rooting percentage did not had significant differences among treatments. The results of this second spring experiment were very similar to the results obtained in experiment # 1 with the treatments following the similar trend.

In experiment # 4 (September, 1991) SG and RL showed highly significant differences among treatments (Table 4). Rooting percentage did not showed significant differences among treatments. However, a trend exist among treatments. Softwood stem tips had the quickest shoot growth, strongest root system, and the greatest rooting percentage among all treatments. Semi-hardwood stem tips, hardwood secondary stems and hardwood main stems followed for root length and rooting percent.

The results of the two experiments performed during the spring (Experiments # 1 and # 3) were very similar. Regardless of significant differences or not, the treatments followed similar trend of performance for the three variables under evaluation in which, softwood stem tips were the best lippia cuttings for an efficient plant production.

For example, this is the case of rooting percent, the variable in which we are more interested. Semi-hardwood stem tips gave the worst rooting percent and the smallest root system.

The results of the two experiments performed during the fall (Experiments # 2 and # 4) were very similar. In the experiment conducted in 1991 the difference among treatments was more evident except for rooting percentage. When comparing the results obtained during the spring and the fall, it is obvious that the use of soft tissue is more convenient during the fall. While during the spring, cuttings from actively growing plants, although fairly woody will root and growth in a satisfactory manner. In both seasons, spring or fall, the newly growth tissue rooted the best.

CONCLUSIONS

Under the prevailing conditions of these experiments, it can be concluded that there is difference in the rooting ability of varied stem maturity cuttings of Caribbean oregano. Herb growers interested in clonally propagate this oregano, should use stem cuttings which still green and soft without forming a brown cortex.

For the three variables under evaluation, which characterizes a good stock plant, softwood stem tips were better than any other more mature cutting regardless of the season. These type of cuttings gave plants with a strong root system and have a single shoot growing fast which allow an easy configuration of the plant by pruning while harvesting. The use of semi-hardwood stem tip cuttings, will give plants with acceptable shoot growth, but with smaller root systems and lower rooting percentage.

Although with certain degree of variability, the rooting percentage results were consistent for both experiments carried out during the spring and the fall. These results implies that rooting percentage could be the best variable to be measured when performing this type of rooting experiments. Finally, it can be concluded that increased wood maturity negatively influenced rooting potential for fall propagated cuttings.

Table 1. Root Lenght (RL), Shoot Growth (SG), and Rooting Percentage (R %) of Caribbean oregano (*Lippia micromera* S.) at different vegetative maturity in experiment # 1.

Treatment	RL	SG	R %
	----rating----		%
Hardwood main stems	3.5 ba	3 b	85
Hardwood secondary stems	3.7 ab	3 b	97
Softwood stem tips	4.7 a	5 a	97
Semi-hardwood stem tips	2.2 c	3 b	72
ANOVA	**	**	NS

[a]Values followed by the same letter are not significant different as LSD test at 5% level. N S, *, * * = Non significant, or significant at the 5 and 1 % level respectively.

Table 2. Root Lenght (RL), Shoot Growth (SG), and Rooting Percentage (R %) of Caribbean oregano (*Lippia micromera* S.) at different vegetative maturity in experiment # 2.

Treatment	RL	SG	R %
	----rating----		%
Hardwood main stems	1.2 ac	1.7 b	67 b
Hardwood secondary stems	2.5 b	2.2 b	90 a
Softwood stem tips	4.5 a	4.7 a	100 a
Semi-hardwood stem tips	4.2 a	4.0 a	94 a
ANOVA	**	**	**

[a] Values followed by the same letter are notsignificant different as LSD test at 5% level. N S,*, * * = Non significant, or significant at the 5 and 1 % level, respectively.

Table 3. Root Lenght (RL), Shoot Growth (SG), and Rooting Percentage (R %) of Caribbean oregano (*Lippia micromera* S.) at different vegetative maturity in experiment # 3.

Treatment	RL	SG	R %
	----rating----		%
Hardwood main stems	3.5 ab[a]	3.5 b	79 ab
Hardwood secondary stems	3.7 ab	2.5 b	92 a
Softwood stem tips	4.5 a	4.7 a	95 a
Semi-hardwood stem tips	3.0 b	3.5 b	73 b
ANOVA	**	**	**

[a] Values followed by the same letter are not significant different as LSD test at 5% level. N S, *, * * = Non significant, or significant at the 5 and 1 % level respectively.

Table 4. Root Lenght (RL), Shoot Growth (SG), and Rooting Percentage (R %) of Caribbean oregano (*Lippia micromera* S.) at different vegetative maturity in experiment # 4.

Treatment	RL	SG	R %
	----rating----		%
Hardwood main stems	2.2 ad	2.7 c	81
Hardwood secondary stems	3.5 c	2.0 d	88
Softwood stem tips	5.0 a	5.0 a	93
Semi-hardwood stem tips	4.2 b	4.0 b	71
ANOVA	**	**	NS

[a] Values followed by the same letter are notsignificant different as LSD test at 5% level. N S,*, * * = Non significant, or significant at the 5 and 1 % level, respectively.

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