research article | *International Journal of Plant Sciences,* (January to June, 2010) Vol. 5 Issue 1 : 269-273

Studies on crop regulation in curry leaf (*Murraya koenigii* Spreng.) during off season

R. SUBHA, P. JANSIRANI AND C. RAJA BABU

Accepted : November, 2009

SUMMARY

An investigation on the effect of mulching, irrigation, water spray, biostimulants, nutrients and growth regulators on growth and productivity was conducted during winter season in comparison with monsoon season. To increase production and quality in winter season application of three per cent panchagavya as foliar spray could be advocated for the curry leaf crop. Though the best treatment of foliar spray of panchagavya was found to influence positively on all the characters of study in both the seasons, the analysis of cost of production, in terms of net income and benefit cost ratio implied that the yield improvement of fresh curry leaf in comparison with the control plot treatment in winter season was the highest and economical .Hence, it could be concluded that the fresh curry leaf yield and quality characters could be improved by foliar spray of three per cent panchagavya at 30 days intervals for two times per season was found to be economical.

Key words : Panchgagavya, Chlorophyll, Curry leaf, Crop rejulation, Growth regulating, Urea, Humicacid, Sali cylic acid, Substances, GA_3

Curry leaf (*Murraya koenigii* Spreng.) is a perennial herbal spice crop grown for its aromatic leaves. Besides, being a spice crop curry leaf plays a major role in the Ayurveda and Unani systems of medicine due to its wide range of medicinal properties. Fresh leaves of curry leaves on distillation give a yellow coloured volatile oil with a strong spicy, odoured, pungent and clove like taste. The essential oil has very good antibacterial and antifungal activity. There is less production of fresh curry leaves during winter season due to unfavourable environmental conditions especially due to low temperature. During that time curry leaf fetches very high market price. Hence, there is a need to promote the production of this crop during winter season to get more profit. It would not only improve the supply of fresh curry leaf but also help the growers to get high profit during the winter months.

MATERIALS AND METHODS

An experiment was conducted with curry leaf to study the effect of mulching, irrigation, water spray, biostimulants, nutrients and growth regulators on growth and productivity during winter season in comparison with monsoon season. The crop was studied from July to October 2006 (monsoon season or regular) and October to December 2006 (winter season or off season) in farmer's field at Kumaran nagar, Kumaran Kuntru, Mettupalayam Tamil Nadu. Totally eleven treatments inclusive of control *viz.*, mulching with black polythene sheet (250 gauge) and coir pith, surface irrigation at 15 days intervals and water spray at 15 days interval, foliar spray of three per cent panchagavya, foliar spray of GA 50 ppm, humic acid 0.2 per cent, salicylic acid 100 ppm, and 200 ppm were applied 30 days after last harvest *viz.*, after initiation of new shoots were impeded on previous season pruned crop. An untreated control was included for comparison. The experiment was laid out in randomized block design and replicated three times. At the time of harvest (90 days after last crop) morphological traits *viz*., plant height, number of secondary branches, leaf number per rachis chlorophyll content, fresh leaf yield per plant, fresh leaf yield per hectare were observed and analyzed statistically.

Correspondence to:
C. RAJA BABU, Division of Plant Physiology, Central Coffee Research Institute, CHIKMAGALUR (KARNATAKA), INDIA
Authors' affiliations:
R. SUBHA AND P.JANSIRANI, Horticultural College and Research Institute, COIMBATORE (T.N.) INDIA

RESULTS AND DISCUSSION

The important morphological characters that influenced the development and productivity of a crop were plant height, number of secondary branches, leaves per rachis and these plant morpho traits were differentially influenced by mulch and application of growth regulating substances. The plant height measured at 90 days after last harvest resulted in the greatest value in monsoon season crop compared to winter season crop. During monsoon season, the highest value of plant height (Table 1) was recorded by the plants treated with panchagavya three per cent as foliar spray. Influence of nitrogen *i.e.* present in panchagavya in promoting vegetative growth

Table 1 : Effect on growth of growth treatment on morphological and physiological characters of curry leaf (*Murraya koenigii* Spreng) during monsoon season

Treatments	Plant height(cm)	S.B.No.	Leaves per rachis	F.L.W with petiole (g)	F.L.W. without petiole(g)	D.L.W with Petiole(g)	D.L.W. With Petiole	Specific leaf area (cm^2 /g)	Specific leaf weight (mg /cm^2)
T_1	98.46	29.12	17.36	2.189	1.902	0.986	0.612	55.94	0.035
T_2	91.21	27.32	16.23	1.982	1.785	0.975	0.692	52.81	0.041
T_3	90.01	26.56	15.24	2.001	1.683	0.812	0.521	51.12	0.039
T_4	89.99	25.64	15.54	1.899	1.598	0.805	0.591	54.82	0.037
T_5	105.74	30.32	18.89	2.265	1.995	1.105	0.751	66.62	0.045
T_6	103.24	28.23	15.20	1.999	1.639	0.851	0.712	49.92	0.038
T_7	90.21	25.81	16.70	2.007	1.549	0.905	0.681	48.82	0.036
T_8	104.62	29.54	17.40	2.225	1.965	1.051	0.748	64.58	0.044
T_9	92.14	27.56	16.01	1.985	1.674	0.925	0.582	55.96	0.034
T_{10}	89.13	26.10	16.47	1.995	1.609	0.950	0.571	57.12	0.033
T_{11}	84.86	21.19	14.58	1.849	1.502	0.597	0.562	44.85	0.031
Mean	94.510	27.035	16.329	2.036	1.718	0.905	0.638	54.778	0.037
S.E.±	5.449	1.502	0.786	0.112	0.099	0.051	0.030	2.835	0.001
C.D.(P=0.05)	11.368	3.135	1.639	0.234	0.207	0.108	0.062	5.914	0.003

T_1- mulching with polythene sheet T_4-water spray T_7-urea (0.5 %) as foliar spray T_{11}-control
T_2-mulching with coir pith T_5-3 % panchagavya as foliar spray T_8-humic acid (0.2 %)as foliar spray
T_3-irrigation T_6-GA(50 ppm) as foliar spray T_9 and T_{10}-salicylic acid 100 & 200 ppm as foliar spray, respectivly

in crops is a well established fact that nitrogen enhanced plant height through its effect on rapid meristematic activity. Similar findings were reported by Thamaraiselvi (2001) in rose, Kanimozhi (2003) in Coleus, Cynthia (2003) in Ashwagandha and Djanaguiraman *et al.* (2003) in tomato. Among the growth regulating treatments in winter season, foliar application of three per cent panchagavya followed by foliar spray of 0.2 per cent humic acid significantly enhanced the plant height at 90 days after harvest.

The number of secondary branches recorded per plant in the different stages of growth was found to be increased. The number of secondary branches was higher in monsoon season (Table 1) than in the winter season (Table 3). The superior performance of the number of secondary branches exhibited by the plants during monsoon months might be due to higher day and night temperatures, higher solar radiation and longer hours of sunshine. Less number of secondary branches observed in winter season crop might be due to lower day as well as night temperatures and less hours of sunshine that prevailed during the winter season. This would have not promoted more branches due to poor partitioning of photo synthates.

The number of secondary branches is an important character directly proportional to yield. During winter season increased in number of laterals by the application of panchagavya (three per cent) in plants was due to increased osmotic effects and uptake of nutrients thereby acceleration in biochemical metabolism which was also confirmed by Sridhar (2003) in *Solanum nigrum.* In the present study, number of secondary branches per plant was significantly increased with the application of panchagavya three per cent. Leaves per rachis are another important yield contributing parameter. In the present study, leaves per rachis were slightly higher in monsoon season than the winter season. The number of leaves per rachis was significantly increased with the foliar application of panchagavya three per cent. Increased number of leaves was due to the increased meristamatic activity in the plant and also due to the enhanced supply of photosynthates. These findings are in confirmation with the findings of Khandait (1991).

The highest chlorophyll content as 'a', 'b' and total chlorophyll recorded by foliar spray of panchagavya (three per cent) might be due to the better availability of nutrients and effective conversion of these pigments *i.e.*, with the application of panchagavya as foliar spray, no chlorotic symptom was observed. Similar to present results Sridhar *et al.* (2003) also observed the increased chlorophyll content due to the application of panchagavya in *Solanum nigrum*. The micro organisms that are present in panchgavya *viz., Acetobacter xylinum, Acetobacter xylinoides, Saccharomycodes ludwigii, Schizosaccharamyces pombe* and *Saccaromyces cerevisiae* and other active components would have acted as a catalyst to improve the plant growth in curry leaf with foliar application of panchagavya (three per cent).

Table 2 : Effect on growth of growth treatment on morphological and physiological characters of curry leaf(*Murraya koenigii* Spreng) during monsoon season

Treatments	Chlorophyll "a" (mg per g)	Chlorophyl l "b"(mg per g)	Total chlorophyll content (mg per g)	Fresh leaf yield per plant (g)	Fresh leaf yield per plot (kg)	fresh leaf yield per ha (tonnes per ha)	Iron content (per cent)	Calcium content (mg per100g)	Essential oil content (per cent)	Shelf life (unpacked)	Self life with five per cent ventilation
T_1	0.036	0.075	0.111	650.25	5.85	6.50	3.31	832.14	0.134	2.12	2.50
T_2	0.035	0.075	0.110	640.71	5.76	6.40	3.28	826.34	0.136	2.21	2.50
T_3	0.031	0.068	0.094	580.81	5.22	5.80	3.09	810.53	0.121	1.11	2.50
T_4	0.033	0.068	0.101	550.67	4.95	5.50	3.17	817.54	0.137	1.45	2.00
T_5	0.040	0.078	0.118	690.52	6.21	6.90	3.72	950.65	0.187	3.21	3.94
T_6	0.035	0.064	0.099	590.67	5.31	5.90	3.41	875.87	0.126	2.51	3.50
T_7	0.033	0.068	0.101	595.95	5.36	5.95	3.16	780.65	0.165	1.56	3.20
T_8	0.036	0.076	0.112	680.61	6.12	6.80	3.69	910.12	0.171	2.65	3.50
T_9	0.034	0.069	0.103	580.48	5.22	5.80	3.16	805.48	0.119	1.16	2.90
T_{10}	0.034	0.069	0.103	605.86	5.44	6.05	3.21	810.68	0.117	1.50	3.00
T_{11}	0.029	0.063	0.092	530.39	4.77	5.30	3.02	760.12	0.122	1.00	2.00
Mean	0.034	0.070	0.104	608.810	5.473	6.081	3.292	834.556	0.139	1.851	2.818
S.E.±	0.001	0.003	0.005	33.381	0.300	0.333	0.164	41.163	0.006	0.125	0.125
C.D. (P=0.05)	0.003	0.008	0.012	69.633	0.626	0.696	0.343	85.866	0.014	0.262	0.262

T_1- mulching with polythene sheet T_4-water spray T_7-urea (0.5 %) as foliar spray
T_2-mulching with coir pith T_5-3 % panchagavya as foliar spray T_8-humic acid (0.2 %)as foliar spray
T_3-irrigation T_6-GA (50 ppm) as foliar spray T_9 and T_{10}-salicylic acid 100 and 200 ppm as foliar spray T_{11}-control

Table 3 : Effect on growth of growth treatment on morphological and physiological characters of curry leaf (*Murraya koenigii* Spreng) during winter season

Treatments	Plant height(cm)	S.B.No.	Leaves per rachis	F.L.W with petiole (g)	F.L.W. without petiole(g)	D.L.W with petiole(g)	D.L.W. with petiole	Specific leaf area (cm^2 /g)	Specific leaf weight (mg /cm^2)
T_1	93.69	20.12	17.18	1.781	1.099	0.815	0.659	44.92	0.033
T_2	91.53	19.02	16.43	1.892	1.265	0.915	0.612	42.02	0.034
T_3	92.44	19.01	15.56	1.791	1.024	0.775	0.562	43.12	0.033
T_4	92.72	17.08	15.23	1.781	1.012	0.724	0.585	44.82	0.034
T_5	99.91	22.23	18.25	1.972	1.275	0.918	0.745	57.21	0.039
T_6	91.62	20.18	14.49	1.685	1.124	0.825	0.566	39.91	0.037
T_7	85.21	18.34	15.89	1.692	1.157	0.814	0.665	38.95	0.033
T_8	98.62	21.28	17.34	1.952	1.196	0.917	0.715	55.02	0.038
T_9	90.52	17.45	16.49	1.679	1.024	0.798	0.626	41.68	0.031
T_{10}	85.27	18.42	15.68	1.591	1.101	0.814	0.647	45.98	0.033
T_{11}	81.91	14.25	13.83	1.589	0.960	0.719	0.495	37.63	0.029
Mean	91.221	18.852	16.033	1.764	1.107	0.821	0.625	44.660	0.034
S.E. ±	4.460	1.039	0.894	0.088	0.061	0.040	0.033	2.276	0.001
C.D. (P=0.05)	9.303	2.168	1.866	0.185	0.128	0.084	0.070	4.748	0.003

T_1- mulching with polythene sheet T_4-water spray T_7-urea (0.5 %) as foliar spray
T_2-mulching with coir pith T_5-3 % panchagavya as foliar spray T_8-humic acid (0.2 %)as foliar spray
T_3-irrigation T_6-GA (50 ppm) as foliar spray T_9 and T_{10}-salicylic acid 100 and 200 ppm as foliar spray T_{11}-control

Table 4 : Effect on growth of growth treatment on morphological and physiological characters of curry leaf(*Murraya koenigii* Spreng) during winter season

Treatments	Chlorophyll "a" (mg per g)	Chlorophyll "b" (mg per g)	Total Chlorophyll content (mg per g)	fresh leaf yield per plant (g)	fresh leaf yield per plot (kg)	fresh leaf yield per ha (tonnes per ha)	Iron content (percent)	Calcium content(mg per100g)	Essential oil content (per cent)	Shelf life (unpacked)	Self life with five per cent ventilation
T_1	0.033	0.071	0.104	395.87	3.56	3.95	3.29	840.23	0.136	2.56	2.92
T_2	0.034	0.065	0.099	435.65	3.92	4.35	3.22	820.12	0.135	2.72	2.85
T_3	0.031	0.061	0.092	405.27	3.65	4.05	3.13	810.43	0.122	1.92	2.50
T_4	0.034	0.059	0.093	380.34	3.42	3.80	3.15	815.54	0.142	1.65	2.00
T_5	0.039	0.075	0.114	450.65	4.05	4.50	3.62	950.37	0.186	3.67	4.00
T_6	0.037	0.059	0.092	350.56	3.15	3.50	3.48	880.87	0.119	2.72	3.50
T_7	0.035	0.058	0.093	340.71	3.06	3.40	3.11	780.21	0.159	1.46	3.00
T_8	0.038	0.072	0.110	438.74	3.94	4.38	3.61	905.32	0.161	2.95	3.96
T_9	0.031	0.062	0.093	310.73	2.79	3.10	3.09	810.78	0.129	1.27	2.56
T_{10}	0.033	0.057	0.090	330.54	2.97	3.30	3.16	800.67	0.128	1.69	3.00
T_{11}	0.029	0.052	0.081	305.63	2.74	3.05	3.04	778.43	0.117	1.21	2.00
Mean	0.034	0.062	0.096	376.790	3.385	3.761	3.263	835.724	0.139	2.165	2.935
S.E.±	0.001	0.004	0.005	20.405	0.183	0.204	0.163	41.728	0.006	0.151	0.134
C.D.(P=0.05)	0.003	0.008	0.011	42.566	0.383	0.425	0.341	87.044	0.014	0.315	0.281

T_1- mulching with polythene sheet T_4-water spray T_7-urea (0.5 %) as foliar spray
T_2-mulching with coir pith T_5-3 % panchagavya as foliar spray T_8-humic acid (0.2 %)as foliar spray
T_3-irrigation T_6-GA (50 ppm) as foliar spray T_9 and T_{10}-salicylic acid 100 and 200 ppm as foliar spray T_{11}-control

Azospirillum present in panchagavya might have also increased the chlorophyll content of leaves which might be attributed to the N fixing ability of *Azospirillum* coupled with its ability to synthesis growth hormones such as IAA, GA and cytokinins besides other enzymes. The monsoon crop can perform well even in the absence of any treatment. In monsoon season crop, yield per plant in control was higher than in the winter season in terms of fresh leaf yield per plant. Plant height, number of secondary branches and chlorophyll content were all optimal under monsoon season which might have engineered towards the high yield. Environmental factors like solar radiation, temperature, long sunshine hours might have also subscribed to the high yield of curry leaf, an ever green foliage plant.

From the economics of cultivation also the treatment T_5 of three per cent panchagavya as foliar spray recorded the highest net return, which could be recommended for exploitation of commercial cultivation of curry leaf. Though the treatment of mulch with black polythene sheet and coir pith recorded considerable amount of gross income as the best treatment next to spray of panchagavya, the cost of cultivation was higher than the other treatments of study which resulted in lesser benefit cost ratio than the control. Hence, it was concluded that application of panchagavya of three per cent, at 30 days intervals for two times per season could improve the herbage yield in the off season crop (winter crop) so as to fetch more returns.

REFERENCES

Cynthia, A.S.E. (2003). Standardization of organic production packages for *Withania somnifera* Dunal. M.Sc. (Hort.) Thesis, Tamil Nadu Agricultural University, Coimbatore. India.

Djanaguiraman, R. (2003). Physiological studies on the effects of nitrophenols on tomato and Cotton. Ph.D., Thesis, Tamil Nadu Agricultural University, Coimbatore-3, India

Kanimozhi, C. (2003). Standardization of organic production packages for *Coleus forskohlii* Briq. M.Sc. (Hort.) Thesis, Tamil Nadu Agricultural University, Coimbatore-3, India.

Khandait, H. M. (1991). Standardization of nitrogen, phosphorus and potash levels for flower production of annual chrysanthemum cv. Yellow. M.Sc. Thesis. Dr. Panjabrao Deshmukh Krishi Vidyapeeth (PDKV), Akola, Maharashtra, India.

Sridhar, T. (2003). Effect of bioregulators on Black nightshade (*Solanum nigrum* L.). M.Sc. (Ag.) Thesis, Tamil Nadu Agricultural University, Coimbatore-3, India.

Thamaraiselvi, S.P. (2001). Physiological studies on petal shedding in Edward rose (*Rosa bourboniana* L.) and Red rose (*R. centifolia* L.). M.Sc. (Hort.) Thesis, Tamil Nadu Agricultural University, Coimbatore, India.

****
*****