RESEARCH | Egyptian Journal of Agricultural Research | Horticulture

Morphological characteristics of hydroponically grown lettuce (*Lactuca sativa*) treated with Pranic Agriculture

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ABSTRACT

Pranic agriculture (PA) is a traditional healing technique. It includes the projection of prana onto the soil, seeds, water and seedlings to improve their growth. Lettuce plants were grown hydroponically and exposed to pranic energy. The study aimed to investigate the effects of PA treatment on the growth of lettuce plants grown hydroponically. Lettuce plants were grown in two different hydroponic sets. For both treatments, seeds, nutrient solutions, lighting, and all other conditions were the same. One set received PA treatment, while the other set, which did not receive any treatment, was referred to as control. Lettuce grown with pranic energy performed significantly better (p 0.05) in terms of vegetative growth [number of leaves (11.51.2), leaf length (16.80.9 cm), leaf area (1501293 cm2), and root length (14.92.4 cm)] when compared to control, having values of 9.51, 14.31.4 cm, 1004387 cm2, and 11.81.4 cm, respectively. Pranic energy influences hydroponically-grown lettuce plants. Pranic energy can be employed to promote plant growth and output. Farmers can use PA treatment to boost crop yields. The precise process through which Pranic energy influences plant development requires additional research.
Keywords: Crop improvement, leaf area, prana; root length, shoot weight, sustainable agriculture

INTRODUCTION

Lettuce (*Lactuca sativa*) is a green, leafy vegetable. It belongs to the Asteraceae family. It has crispy green, crimson/red leaves. Lettuce is a commonly consumed leafy vegetable worldwide. It is low in fat, calories, and sodium. Lettuce is consumed as a rich source of vitamin C, fibre, iron and benefits for human health. It is also a good source of various other health-beneficial bioactive compounds like folate, β -carotene, lutein, and phenolics. It is commonly cultivated and is suitable for hydroponic cultivation. It's a short-lived vegetable that is easily cultivated. It is mainly grown for salad purposes because it's very suitable for fresh cutting and consumption (Abdalla *et al.,* 2021; Mohammed *et al.,* 2019). It needs low maintenance costs and cultivation techniques. The crop can be harvested within 30 to 40 days, so best suitable for artificial indoor cultivation and experimental purpose to get results soon and repeat experiments easily. Hydroponic is a soilless method of growing plants using solution mixed with nutrients (Miller *et al.*, 2020). A hydroponic system can provide plants/crops with uniform sizes and balanced nutrients. The hydroponic system is useful to overcome problems from aberrant weather change and drought conditions. It also serves as a perfect experimental setup to prove new technologies in a controlled condition and observe minor changes clearly (Ohse *et al.,* 2001). Experiments may be done more than once using the hydroponic growing approach to validate the results without the impact of seasons (Abd El-Wanis *et al.,* 2018).

Pranic healing is the art of healing the bioplasmic body by using prana, or life force (Sui, 2015). Prana is an important energy source to keep the body in healthy conditions. The bioplasmic body, or "aura," that surrounds all living organisms is formed by prana, or life force. The word "bio" in bioplasmic means "life" and "plasmic" refers to plasma, the fourth state of matter. Scientists using Kirlian's photography have found the bioplasmic body (Sadikov, 2000). Plants absorb prana from water, air, sun, and soil (Sui, 2015). Providing pranic energy to plants is termed "Pranic Agriculture" (PA), and it has proved effective in many crops to improve growth and yield. PA is a complementary treatment for agriculture. Various PA studies have been conducted in greenhouses and fields and proved effective in increasing germination and seedling vigour index (Prasad and Jois, 2020). Even the shelf life of vegetable crops was also improved by pranic energy treatment (Jois et al., 2019). In another study, a variation was observed in chlorophyll content and DNA after pranic energy treatment in chilli plants (Poornima et al., 2021). Growing plants in a hydroponic system reduces the influence of the environment and gives accurate results in a controlled setup. With this view, to study the effect of pranic agriculture treatment on crop growth and yield, a hydroponic method was adopted for more preciseness. So, a hydroponic experiment was conducted on a lettuce crop to find out the influence of PA on plant growth.

MATERIAL AND METHODS

Plant Material:

Lettuce varieties, Grand Rapids, from Omaxe company (New Delhi, India), were used for this experiment. This experiment was carried out in September 2020 at the World Pranic Healing Foundation, India-Research Centre, Mysuru, Karnataka, India.

Pranic Treatment:

Seeds, water, cocopeat, clay pebbles, and nutrient solution were divided into two groups: control and pranic. The Pranic group received Pranic treatment, while the control group did not receive any treatment. For the pranic group, pranic treatment was given to seeds, **water**, cocopeat, clay pebbles, and nutrient solution twice for 15 minutes. The pranic treated and control seeds were placed in their respective treatment seedling trays filled with cocopeat and watered. The Pranic healer first prays to the almighty God. The healer then sensitises his hands and scans the seeds, nutrient solution, water, and cocopeat. Contaminated energies are perceived as heavy energies in their hands, and they are removed by flicking into a saltwater bowl kept with them using green prana, which has cleaning properties. The healer then energizes the seeds, nutrient solution, water and cocopeat with new electric violet prana (Sui, 2015). Booster pranic healing sessions were provided on weekly basis to maintain energy hygiene.

Hydroponic Growth Conditions:

Seedlings began to germinate after 4 days of sowing (DOS). From fifth day, seedlings were sprayed daily twice for six days with one-fourth strength of Hoagland's nutrient solution. A basal nutrient solution (Hoagland and Arnon, 1950) was used with some changes and called a modified Hoagland nutrient solution (Taiz and Zeiger, 2010). This nutrient solution contains macro and micronutrients prepared separately. Macro-nutrients comprises KNO_3 (Nitrogen -224 ppm and K-235 ppm), Ca $(NO_3)_2.4H_2O$ (Calcium-160 ppm), $NH_4H_2PO_4$ (Phosphorous- 62 ppm), $MgSO_4.7H_2O$ (Sulphur- 62 ppm and Magnesium- 32 ppm). Micro-nutrients consist of KCl (Chlorine-1.77 ppm), H_3BO_3(Boron- 0.27 ppm), $MnSO_4.H_2O$ (Manganese-0.11 ppm), $ZnSO_4.7H_2O$ (Zinc-0.13 ppm), $CuSO_4.5H_2O$ (Copper- 0.03 ppm), H_2MoO_4 (Molybdenum-0.05 ppm) and NaFe DTPA (Iron-3 ppm). After 12 days of germination, seedlings were shifted to NFT (Nutrient Film Technique) hydroponic system (Hydrilla company, India). Two different setups for Pranic and Control were maintained separately for each treatment, with 18 plants in each treatment. The seedlings are supplied with half-strength nutrient solution. The grow cups were filled with clay pebbles for holding moisture for 1 to 2 hours and also to give mechanical support for anchoring of roots. The setup is fixed with a series of 0.2 W white, blue, and red LED lights (Nexsel, India), to provide sufficient photo radiation (2000 lux) for lettuce foliage growth. The distance between LED lighting and lettuce plants was about one and a half feet. Once the plant is acquainted (up to 4 days) with the new microclimate (NFT setup) they were supplied with full strength nutrient solution (**Figure 1**). A timer is connected to light and nutrient flow. A photoperiod of 14-hour light, followed by 10-hour dark was maintained throughout the experiment. The pH of 5.5 - 6.5 and Electrical Conductivity (EC) of 0.8 -1.2 mS/cm was maintained for the nutrient solution. EC and pH were checked every day and adjusted if required.

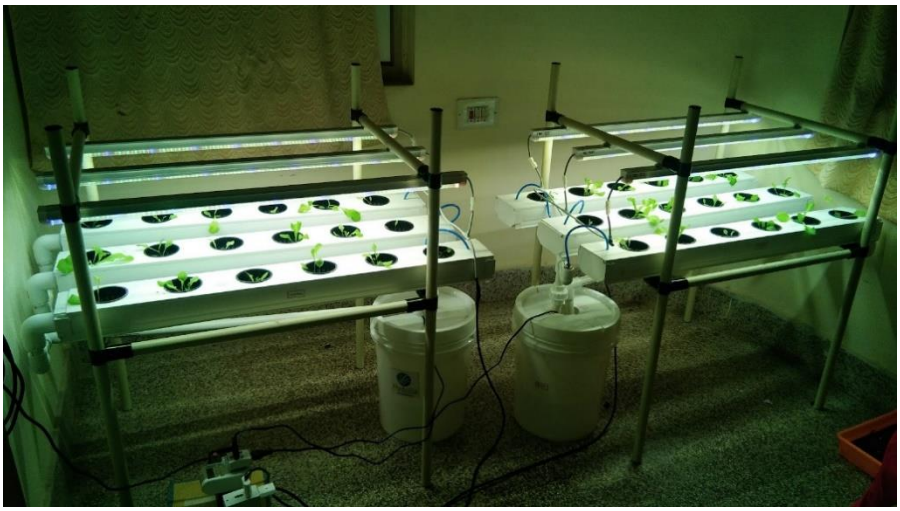

Fig. 1. NFT setup of lettuce plants grown hydroponically (control and pranic)

Observations:

Plants were harvested on the 35th day after transplanting (**Figure 2**) and morphological observations like plant height (cm), stem girth(cm), No. of leaves, leaf length (cm), leaf breadth (cm), root length (cm), Shoot fresh

weight (g) and root fresh weight (g) were noted. Leaf area (cm2) was calculated by leaf breadth, leaf length and the number of leaves. The plants were kept for air drying for 10 days, and shoot and root dry weight(g) were noted.

Statistical analysis:

The experiment was repeated two times individually by keeping all experimental conditions uniform, and the data analysis was done for the mean values of two experiments. The data are shown as the mean (M) and standard deviation (SD) of three replicates. The data were tabulated and analysed in Microsoft Excel using a t-test, with the level of significance set at 5% (p 0.05).

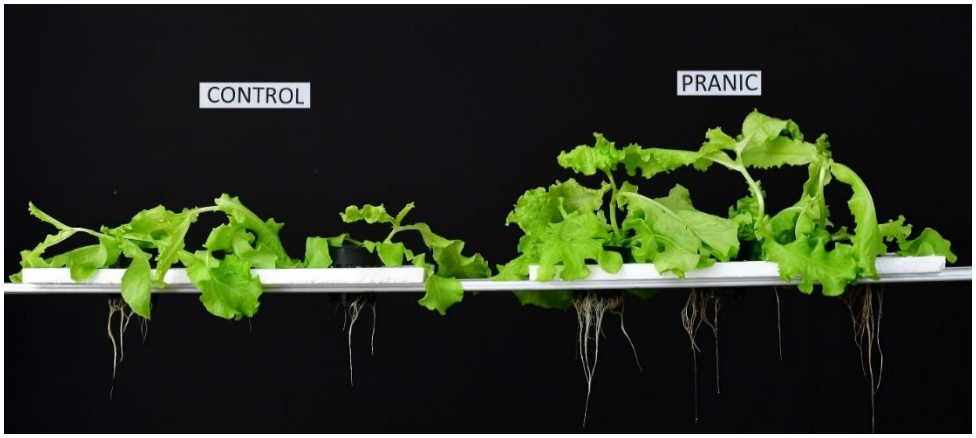

Fig. 2. Control and Pranic group Lettuce plants are grown hydroponically during harvest

RESULTS

Significant difference in plant height (cm) (t=-2.19, p<.05), number of leaves (t= -3.65, p<.05), leaf length (cm) (t= -4.12, p<.05), leaf area (cm^2) (t= -2.89, p<.05), root length (cm) (t= -3.05, p<.05), root fresh weight(gm) (t= -3.44, p<.05), shoot dry weight(g) (t= -2.57, p<.05) and root dry weights(g) (t= -2.98, p<.05) was seen in pranic group when compared with control group. The percentage increase in pranic group, when compared to control was found to be 27% in plant height, 21.6% in number of leaves, 17.5% in leaf length, 49.5% in leaf area, 25.7% in root length, 44% in root fresh weight, 44.5% in shoot dry weight, and 108.3% in root dry weight. However, no significant difference between the leaf breadth (t= -2.02, p>.05), stem girth (t= -1.20, p>.05) and shoot fresh weight (t= -1.86, p>.05) of the pranic and control lettuce were noticed. The percentage increase in the pranic group in terms of plant height, leaf area, root fresh weight, shoot dry weight, and root dry weight over the control suggests that the pranic treated plants are performing better, which might lead to greater foliage in the pranic group. (**Table 1**)

Table 1. Variation in morphological traits between control and pranic treatment in hydroponically grown lettuce

Traits	Control		Pranic		*t-stat*	sig	Increase over control (%)
	Mean	SD	Mean	SD			
Plant height (cm)	23.43	5.82	29.81	5.81	-2.19	0.05	27
Stem girth(cm)	0.51	0.11	0.59	0.14	-1.20	0.25	14
No. of leaves	9.50	1.04	11.56	1.21	-3.65	0.00	21.6
Leaf length (cm)	14.31	1.44	16.81	0.93	-4.12	0.00	17.5
Leaf breadth (cm)	6.75	1.11	7.63	0.51	-2.02	0.06	13
Leaf area (cm^2)	1004.3	387.3	1501.5	293.5	-2.89	0.01	49.5
Root length (cm)	11.87	1.41	14.92	2.44	-3.05	0.01	25.7
Shoot fresh weight (g)	14.83	3.20	19.21	5.84	-1.86	0.08	30
Root fresh weight (g)	1.35	0.34	1.95	0.36	-3.44	0.00	44
Shoot dry weight (g)	1.82	0.50	2.63	0.73	-2.57	0.02	44.5
Root dry weight (g)	0.24	0.05	0.50	0.25	-2.98	0.01	108.3

DISCUSSION

Studies on lettuce grown in protected cultivation and open field conditions, the leaf fresh weight (g) and leaf dry weight (g) were found higher in protected cultivation (100.2 and 4.61) as compared to open field (73.1 and 4.01). Even the stem fresh weight and dry weight were also higher in protected cultivation (41.22 and 1.53) than in open fields (10.88 and 0.67). Also, the leaf area and absolute growth rate were found higher in protected cultivation as compared to field-grown lettuce (Santos *et al.,* 2009). Protected cultivation offers good environmental conditions like light, temperature, and humidity. It also provides better availability of nutrients and distribution among leaf, root and stem promoted higher growth and development (Rufí-Salís *et al.,* 2020). Recent research has demonstrated that when water is treated with Pranic energy, the surface tension and contact angle of the water are reduced. Reduced surface tension of water aids in increased nutrient absorption by plants owing to an increase in wettability (Ananthakeshava *et al.,* 2021). Generally, stem and root are functionally interdependent and work together to achieve a balance in the acquisition of both above ground (light and CO2) and below ground (water and nutrients) resources. More root growth increases the distribution of resources to leaves and stems. The root is one of the most important parts of the plant, from where the plant absorbs necessary water and minerals and supplies the same to the above-ground plant parts. There is always an interdependent association between the root and shoots, called a source-sink association. Active roots supply a sufficient amount of nutrients, phytohormones, and water to shoots, and in turn, the healthy leaf synthesizes photosynthates and supplies the root for its growth and uptake. (Qi *et al*., 2019). An increase in the root growth might have influenced the growth of leaf and stem by pranic treatment. Another probable reason can be attributed to the increase in the synthesis of the IAA hormone in the root and shoot tips, and it helps in cell elongation and apical dominance (Paque and Weijers, 2016). In a similar experiment, where lettuce and rocket crown were grown in a floating culture system with varying levels of nitrogen (N) as 100, 150 and 200 mg L^{-1} of N. Both lettuce and rocket crops showed higher shoot fresh weight (411.4 and 199.1 g) and a number of leaves (18.9 and 11.2), respectively at 200 mgL^{-1} (Petropoulos *et al.,* 2016). Similarly, in another study, the combined use of energy art and energy art treated water had a significant impact in improving the growth of hydroponically grown lettuce and Bok choy plants. Combined Energy art + energy art treated water treatment showed the highest number of leaves (12.3 and 2), leaf dry mass (g) (1.9 and 2.5) leaf area(cm2) (606.6 and 699) and root dry mass (g) (0.4 and 0.5) against control and the individual treatments in lettuce and boy choy crop, respectively. The impact was found highest, especially in carotenoid and chlorophyll content also (Lee and Wu, 2019). Lettuce was grown in different cultivation methods, namely, aeroponic, hydroponic, and substrate cultivation. Hydroponics and aeroponics methods gave higher shoot and root growth than the substrate method. But root traits like root area (479 cm2), number of roots (75), root volume (7.24) and root dry weight (0.80 g) were all found highest in the aeroponic method as compared to hydroponic. But in contrast hydroponic method showed higher shoot fresh weight (88.8 g) and shoot dry weight (4.86 g) as compared to aeroponics (Li *et al.,* 2018). Pranic energy is subtle and unquantifiable yet has brought considerable changes in plants. The major drive area is how the projected pranic energy affects plant physiology and brings about morphological changes that need to be explored.

CONCLUSION

Lettuce plants grown hydroponically with pranic treatment have improved plant growth, plant length, root length, and leaf growth. Pranic agriculture could benefit farmers by enhancing their crop growth. Future work needs to be investigated into how these improvements in Pranic treated plants and their mechanisms come about.

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السمات المورفولوجية للخس المزروع مائيا (*Lactuca sativa*) والمعامل بزراعة برانيك

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الملخص

وكان الهدف من هذه الدراسة هو التحقيق في آثار العلاج الزراعي برانيك على نمو نباتات الخس التي تزرع مائيا.وتشمل الزراعة برانيك بتعريض البذور والمياه والشتلات لطاقة برانيك بهدف تحسين نموها.كانت نباتات الخس المعرضة للطاقة برانيك أكبر بكثير من حيث النمو النباتي) عدد الأوراق وطول الأوراق ومنطقة الأوراق وطول الجذر ووزن الجذر (، بالمقارنة مع النباتات المقارنة.وأظهرت نتائج هذه الدراسة آثار كبيرة للطاقة برانيك على نباتات الخس المزروعة مائيا.يمكن استخدام الطاقة برانيك كنهج بديل لتحسين نمو النباتات والغلة.ويمكن للمزارعين ممارسة علاج برانيك لتعزيز نمو زراعات الخس.الآلية الدقيقة ولكن كيفية تأثير الطاقة برانيك على نمو النبات يحتاج إلى مزيد من التحقق بتجارب مستقبلية.

الكلمات المفتاحية: تحسين المحاصيل، برانيك؛ طول الجذر، ووزن الجذور، الزراعة المستدامة