

Effect of Some Natural Extracts on Growth and Chemical Constituents of *Schefflera arboricola* Plants

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Abstract: This investigation had been carried out at the Ornamental Horticulture Department, Faculty of Agriculture, Cairo University, Giza, Egypt and Ornamental Plants Research Department, Horticulture Research Institute, Giza, Egypt under a shade net house in the nursery in the two seasons of 2007–2008 and 2008–2009, in order to investigate the effect of some natural extracts on the growth and some chemical constituents of *Schefflera arboricola*. The obtained results can be summarized as follows: The highest values of plant height, stem diameter, dry weight of leaves/plant, leaf area, total carbohydrates and N contents were obtained with garlic extract followed by yeast extract, then aloe extract and finally henna extract in the two seasons. Also in the first season, the highest values of leaves fresh weight/plant were obtained with garlic extract, followed by yeast extract then aloe extract and finally henna extract; whereas in the second season the highest values of previous parameters were resulted in garlic extract followed by yeast extract, then henna extract and finally aloe extract. As well as, the highest values of leaves fresh weight/plant were obtained with garlic extract followed by aloe extract then yeast extract and finally henna extract in both seasons, thus application of garlic extract resulted in the highest values of all recorded characters. Whereas the lowest values of all recorded characters were resulted in control treatment in both seasons. At the same time the highest values of all recorded parameters were obtained with using soil drench technique as compared with foliar spray method except fresh weight of leaves/plant in the first season. The interaction between any extract type and any methods of application increased all recorded parameters as compared with interaction between the control treatment and any methods of application. The highest values of all recorded characters were obtained with the interaction between garlic extract and soil drench technique in most cases.

Key words: Natural Extracts · *Schefflera Arboricola*

INTRODUCTION

Schefflera arboricola is a plant in the Araliaceae family, native to the islands of Taiwan and Hainan, China. It is an evergreen shrub which can reach to 3-4 m tall [1]. The use of juices or extracts of certain plants as biostimulants (sometimes referred to as botanical activators or botanicals) was tried successfully by a lot of workers.

Effect of active dry yeast extract: Ali [2] on *Calendula officinalis* proved the significant effect of yeast on the vegetative growth and flowering characters of the plant as well as increase in the leaf content of N and P as concentration of the yeast was increased in the solution. Abd El-Latif [3] stated that spraying *Salvia officinalis* with active dry yeast at 5 g/l significantly increased fresh

and dry weights of herb and leaves. Safwat *et al.* [4] on *Euonymus japonicus* plants showed that adding active dry yeast extract at 4 g /l twice plus 6 g NPK/plant increased number of branches, fresh and dry weights of roots, carotenoids content in leaves and potassium percentage in roots. While, supplying the plants with yeast thrice caused an increment in stem diameter, root length and nitrogen percentage in shoots. Abdel-Wahid [5] showed that using active dry yeast at the rate of 8 g/l increased plant height and stem diameter of potted *Brassaia arboricola*. Gehan *et al.* [6] found that spray the aqueous solution of active dry yeast (8g/l) alone, thrice with one month interval on the leaves improved the growth and performance of *Brassia actinophylla*, Endl. plants grown in 20 cm diameter plastic pots.

Effect of Aloe extract: Youssef [7] stated that soaking seeds in Aloe extract at 50 and 100% concentrations increased fresh and dry weights of leaves and number of florets per spike of *Delphinium ajacis* and flower head of *Callistephus chinensis*. DongZhi *et al.* [8] concluded that the aqueous leaf extract of *Aloe vera* could be useful as a natural plant growth regulator. Padmaja *et al.* [9] stated that *Aloe vera* peelings powder at 140 g/pot significantly increased fresh and dry weights of Lady's Finger (*Abelmoschus esculentus*) plants. El-Shayeb [10] declared that all concentration of *Aloe vera* extract increased fresh and dry weights of flowers of *Oenothera biennis*. The best response resulted from the highest concentration of Aloe (75%).

Effect of Garlic extract: The effect of garlic extract on different plant characters could be interpreted in the light of the following findings. Helmy [11] applied fresh garlic clove extract solution (in ethyl alcohol or tap water) to summer squash cv. Eskandarani plants. He remarked that soil side dressing of garlic extract at 250 mg dw/plant gave the best results in increasing the number of flowers. Ahmed *et al.* [12] confirmed that greater increase in number of pods of pea (cv. Meteor) was obtained with post inoculation treatment with garlic extract at 10 g/8 liters. Sayeeda and Ahmed [13] reported that garlic bulb extract showed comparatively greater efficacy on promoting growth of two local varieties of groundnut.

Effect of Henna extract: Chandrasekaran *et al.* [14] mentioned that soyabean seed treatment with *Lawsonia inermis* leaf extract at 10% increased shoot length significantly. Pathak and Srivastava [15] stated that the total phenols content in sunflower was maximum after treatment with *Lawsonia inermis*. Singh *et al.* [16] revealed that the extract of henna gave significantly superior control of whitefly in tomato over the untreated check.

MATERIALS AND METHODS

This investigation had been carried out at the Ornamental Horticulture Department, Faculty of Agriculture, Cairo University, Giza, Egypt and the plants of experiment placed at Ornamental Plants Research Department, Horticulture Research Institute, Giza, Egypt, under a shade net house in the nursery of the ornamental plant research department, during the two seasons of 2007–2008 and 2008–2009. Rooted cuttings of *Schefflera arboricola* plants, 15-17 cm long, were planted in August in 30 cm diameter pots filled with a mixture of nursery soil

and peat moss at 1:1 (v:v). The application of natural extracts started in The first October and was repeated monthly for 6 months in the two seasons.

Extract Preparation: Extracts or juices of aloe, garlic, yeast and henna were prepared as follows:

Aloe (*Aloe Vera*, Syn. *A. Barbadosensis*): One kilogram of *Aloe vera* fleshy leaves was obtained, the two side margins were removed, the remainder was cut to pieces and blended in a blender. The blend was removed in a gauzesh and squeezed powerfully. The juice was obtained in a glass beaker and used at 10%.

Garlic (*Allium sativum*): Newly produced garlic cloves were brought. 250 g of these cloves were put in a glass beaker containing 250 ml of tap water. The beaker was put in a freezer for one day, after which, frozen beaker was left to thaw. Freezing and thawing were repeated three. Water was added to a final volume of 1 liter before filtering. Final size of the filtrate was adjusted to 1: 1, before being used.

Yeast (*Saccharomyces cerevisiae*): Relatively newly produced active dry yeast was obtained and 10 g of yeast was weighed and put with 100 cm³ of water in a glass beaker. A teaspoon full of sugar was added. The beaker was kept in a dark warm place for 30 minutes. Contents of the beaker were then filtered into a 1 liter measuring flask and water was added to 1 liter final volume.

Henna or Lawsonia (*Lawsonia Alba*, Syn. *L. Inermis*): Henna leaves were obtained and dried in a dry shaded place for 1 week. Dry leaves were then ground. 10 g of the pulverized leaves were weighed and put in a 1 liter measuring flask, which was left to soak for 1 hour, after which contents were filtered on a sieve and the final volume of the extract was restored to 1 liter.

Experimental Design: An experiment was carried out to test the effects of two factors. The first factor was the extract type. Extracts were 10 cm³ aloe juice/l; 10 g of either henna or yeast powder/l; and garlic at 250 g, in addition to the control treatment, where tap water was used. The second factor was the application method, where extracts were applied either as a soil drench or a foliar spray. This experiment was repeated in two seasons. The experiment Unit contained 6 potted plants and each treatment content 18 plants. The statistical analysis of the experiment was factorial in randomized complete blocks design.

Data Recorded Were

A-Vegetative Growth:

- Plant height (cm).
- Number of leaves/plant.
- Fresh weight of leaves (g/plant).
- Dry weight of leaves (g /plant).
- Leaf area (cm²).

Chemical Constituents:

- Content of total carbohydrates (mg/100 mg FW).
- N% content.

Chemical characteristics were determined in the second season only as follows: Total carbohydrates according to method of A.O.A.C. [17].

Nitrogen content according to method of Jackson [18].

Data were statistically analyzed using SAS Computer Program [19] and means were compared by L. S. D. method according to Snedecor and Cochran [20].

RESULTS AND DISCUSSION

Plant Height (cm): Data shown in Table 1 indicated that all extract types (Aloe, Garlic, Yeast and Henna) had a significant effect on increasing plant height as compared with control treatment. The tallest plants (76.91 and 79.85cm) were produced with garlic extract in the first and second seasons, respectively, while the shortest plants (48.55 and 49.95) were resulted in the control plants in the second and first seasons, respectively. Regarding method

of application, it was clear that the highest values (63.39 and 65.01cm) were produced from drench application in the first and second seasons, respectively, whereas the lowest values (60.28 and 62.19) were produced with spray method in the second and first seasons, respectively.

The interaction between extract type and method of application had a clear effect on increasing plant height as compared with the control and the two methods of application. It was evidence that the tallest plants (77.73 and 84.71cm) were obtained with the interaction between garlic extract and drench application in the first and second seasons, respectively. These results were in agreement with those obtained by Chandrasekaran *et al.* [14] who found that soybean seed treatment with *Lawsonia inermis* leaf extract at 10% increased shoot length significantly. El-Desouky *et al* [21] who soaked squash (*Cucurbita pepo*) seeds in garlic extract at 50, 250 or 500 ml/l and found that all treatments significantly increased stem length.

Number of Leaves/Plant: Data shown in Table 2 indicated that all extract types (Aloe, Garlic, Yeast and Henna) had a significant effect on increasing number of leaves as compared with control treatment. The highest numbers of leaves (26.50 and 26.17 leaves) were observed on plants treated with garlic extract in the first and second seasons, respectively, while the lowest number of leaves (17.00 and 20.33 leaves) were resulted in the control plants in the second and first seasons, respectively. Regarding method of application, it was clear that the highest number of leaves (22.33 and 23.73 leaves) were produced from drench application in the first and second seasons, respectively, whereas the lowest number of leaves (21.00 and 21.33) were produced with spray method in the

Table 1: Effect of extract type, application methods and their interaction between them on plant height (cm) of *Schefflera arboricola*, during the seasons of 2007/2008 and 2008/2009

| Extract type (T.) | First season (2007/2008) | | | Second season (2008/2009) | | |
|-------------------|----------------------------|--------|-------|----------------------------|--------|-------|
| | Method of application (M.) | | | Method of application (M.) | | |
| | Spray | Drench | Mean | Spray | Drench | Mean |
| Control | 49.95 | 49.95 | 49.95 | 48.55 | 48.55 | 48.55 |
| Aloe | 61.13 | 63.14 | 62.13 | 59.64 | 60.10 | 59.87 |
| Garlic | 76.08 | 77.73 | 76.91 | 75.00 | 84.71 | 79.85 |
| Yeast | 67.16 | 68.40 | 67.78 | 63.79 | 71.79 | 67.79 |
| Henna | 56.62 | 57.72 | 57.17 | 54.42 | 59.89 | 57.16 |
| Mean | 62.19 | 63.39 | | 60.28 | 65.01 | |
| L.S.D. T. | 4.03 | | | 2.89 | | |
| L.S.D. M. | N.S. | | | 1.83 | | |
| L.S.D. T. x M. | N.S. | | | 4.08 | | |

Table 2: Effect of extract type, application methods and their interaction between them on number of leaves of *Schefflera arboricola*, during the seasons of 2007/2008 and 2008/2009

| Extract type (T.) | First season (2007/2008) | | | Second season (2008/2009) | | |
|-------------------|----------------------------|--------|-------|----------------------------|--------|-------|
| | Method of application (M.) | | | Method of application (M.) | | |
| | Spray | Drench | Mean | Spray | Drench | Mean |
| Control | 17.00 | 17.00 | 17.00 | 20.33 | 20.33 | 20.33 |
| Aloe | 21.67 | 26.00 | 23.83 | 21.00 | 24.33 | 22.67 |
| Garlic | 25.67 | 27.33 | 26.50 | 22.67 | 29.67 | 26.17 |
| Yeast | 21.67 | 23.33 | 22.50 | 21.33 | 23.33 | 22.33 |
| Henna | 19.00 | 18.00 | 18.50 | 21.33 | 21.00 | 21.17 |
| Mean | 21.00 | 22.33 | | 21.33 | 23.73 | |
| L.S.D. T. | 3.14 | | | 3.41 | | |
| L.S.D. M. | N.S. | | | 2.16 | | |
| L.S.D. T. x M. | N.S. | | | N.S. | | |

Table 3: Effect of extract type, application methods and their interaction between them on fresh weight of leaves (g/plant) of *Schefflera arboricola*, during the seasons of 2007/2008 and 2008/2009

| Extract type (T.) | First season (2007/2008) | | | Second season (2008/2009) | | |
|-------------------|----------------------------|--------|-------|----------------------------|--------|-------|
| | Method of application (M.) | | | Method of application (M.) | | |
| | Spray | Drench | Mean | Spray | Drench | Mean |
| Control | 52.18 | 52.18 | 52.18 | 49.87 | 49.87 | 49.87 |
| Aloe | 60.60 | 63.33 | 61.97 | 55.52 | 51.79 | 53.65 |
| Garlic | 82.09 | 84.88 | 83.49 | 94.61 | 96.08 | 95.34 |
| Yeast | 63.02 | 64.40 | 63.71 | 64.52 | 73.76 | 69.14 |
| Henna | 58.70 | 42.23 | 50.47 | 53.13 | 58.69 | 55.91 |
| Mean | 63.32 | 61.40 | | 63.53 | 66.04 | |
| L.S.D. T. | 12.60 | | | 3.39 | | |
| L.S.D. M. | N.S. | | | 2.15 | | |
| L.S.D. T. x M. | N.S. | | | 4.80 | | |

first and second seasons, respectively. The interaction between extract type and method of application had a clear effect on increasing numbers of leaves as compared with the control and the two methods of application. It was evidence that the greatest numbers of leaves (27.33 and 29.67 leaves) were obtained with the interaction between garlic extract and drench application in the first and second seasons, respectively. These results were in harmony with Ahmed *et al.* [12] confirming that greater increase in the number of pods of pea was obtained with post inoculation treatment with garlic extract at 10 g/8 liters. Amer [22] on *Phaseolus vulgaris* concluded that using 2 g/l of yeast was increased number of leaves.

Fresh Weight of Leaves (G /Plant): From the data in Table 3 it can be noticed that the extract of Aloe, Garlic and Yeast had a significant effect on increasing fresh weight of leaves per plant as compared with the control treatment in the two seasons. The highest fresh weights of leaves (83.49 and 95.34 g) were produced with garlic extract in the first and second seasons, respectively, whereas the lowest fresh weight of leaves (52.18 and 49.87 g) were resulted in control treatment in the first and

second seasons, respectively. Concerning to the methods of application on fresh weight of leaves/plant, it was clear that the highest values (22.33 and 23.73 g) were obtained with drench method in the first and second seasons, respectively, using spray method gave 21.00 and 21.33 g in the first and second seasons, respectively, thus the drench method better than the spray method on increasing fresh weights of leaves. Regarding the interaction between extract types and methods of application on fresh weights of leaves, it was clear that all the interaction between all extract types and spray or drench methods increased fresh weights of leaves as compared with the interaction between the control treatment and spray or drench methods in the two seasons, thus the highest fresh weights of leaves (84.88 and 96.08 g) were produced with the interaction between garlic extract added as drench method in the first and second seasons, respectively. These findings were in line with those of Noor El-Deen [23] concluded that aqueous extract of garlic at 100% (250 cm garlic juice/l) or ethyl extract of garlic at 50% (125 cm garlic juice/l) increased fresh and dry weights of *Majorana hortensis*.

Table 4: Effect of extract type, application methods and their interaction between them on dry weight of leaves (g/plant) of *Schefflera arboricola*, during the seasons of 2007/2008 and 2008/2009

| Extract type (T.) | First season (2007/2008) | | | Second season (2008/2009) | | |
|-------------------|----------------------------|--------|-------|----------------------------|--------|-------|
| | Method of application (M.) | | | Method of application (M.) | | |
| | Spray | Drench | Mean | Spray | Drench | Mean |
| Control | 15.79 | 15.79 | 15.79 | 20.22 | 20.22 | 20.22 |
| Aloe | 19.85 | 21.63 | 20.74 | 22.20 | 42.96 | 32.58 |
| Garlic | 25.45 | 26.95 | 26.20 | 41.48 | 52.58 | 47.03 |
| Yeast | 23.96 | 25.74 | 24.85 | 32.37 | 42.58 | 37.48 |
| Henna | 18.29 | 20.43 | 19.36 | 23.72 | 32.69 | 28.21 |
| Mean | 20.67 | 22.11 | | 28.00 | 38.21 | |
| L.S.D. T. | 2.32 | | | 2.47 | | |
| L.S.D. M. | N.S. | | | 1.56 | | |
| L.S.D. T. x M. | N.S. | | | 3.49 | | |

Table 5: Effect of extract type, application methods and their interaction between them on leaf area (cm²) of *Schefflera arboricola*, during the seasons 2007/2008 and 2008/2009

| Extract type (T.) | First season (2007/2008) | | | Second season (2008/2009) | | |
|-------------------|----------------------------|--------|--------|----------------------------|--------|--------|
| | Method of application (M.) | | | Method of application (M.) | | |
| | Spray | Drench | Mean | Spray | Drench | Mean |
| Control | 103.58 | 103.58 | 103.58 | 100.36 | 100.36 | 100.36 |
| Aloe | 126.72 | 137.14 | 131.93 | 119.28 | 138.10 | 128.69 |
| Garlic | 156.57 | 161.61 | 159.09 | 160.67 | 174.79 | 167.73 |
| Yeast | 151.72 | 156.85 | 154.28 | 129.63 | 142.19 | 135.91 |
| Henna | 117.89 | 123.36 | 120.62 | 114.37 | 127.03 | 120.70 |
| Mean | 131.30 | 136.51 | | 124.86 | 136.49 | |
| L.S.D. T. | 2.88 | | | 2.77 | | |
| L.S.D. M. | 1.82 | | | 1.75 | | |
| L.S.D. T. x M. | 4.07 | | | 3.92 | | |

Dry Weight of Leaves (G/Plant): The data presented in Table 4 show that the trend of the results of dry weight of leaves similar to the trend of the results of fresh weight of leaves in the two seasons. The heaviest dry weight of leaves were found on plants treated with garlic extract (26.20 and 47.03 g/plant) were produced with garlic extract in the first and second seasons, respectively, followed with a significant difference by those treated with yeast extract (24.85 and 37.48 g/plant in the first and second seasons, respectively).

The untreated control plants significantly produced the lightest dry leaves (15.79 and 20.22 g/plant, in the first and second seasons, respectively). Regarding methods of application, it was clear that the soil drench technique resulted in heavier dry leaves (22.11 and 38.21 g/plant, in the first and second seasons, respectively) compared to the foliar spray method (20.67 and 28.00 g/plant, in the first and second seasons, respectively). The interaction between extract types and methods of application on dry weight of leaves, it was clear that applying a garlic

extract as a soil drench resulted in the heaviest dry leaves (26.95 and 52.58 g/plant, in the first and second seasons, respectively) were produced with the interaction between garlic extract added as drench method. These results are in agreement with those obtained by El-Shayeb [10] stating that all concentrations of garlic extracts increased dry weights of leaves of *Oenothera biennis*. The best response resulted from the highest concentration of garlic (75%). Heikal [24] on *Thymus vulgaris* indicated that foliar application of active dry yeast (20 and 40 g/l) significantly increased leaf /stem fresh weight ratio, herb fresh and dry weights.

Leaf Area (cm²): It is evident from the data of Table 5 that the extract type significantly affected leaf area. Leaves of plants treated with garlic extract significantly had the greatest leaf area (159.09 and 167.73 cm²), followed with significant differences by those of plants treated with yeast (154.28 and 135.91 cm²), aloe (131.93 and 128.96 cm²) or henna (120.62 and 120.70 cm²), in the first and second

Table 6: Effect of extract treatments and application method on Total carbohydrates percentage (%) of *Schefflera arboricola*, during the seasons of 2007/2008 and 2008/2009

| Extract type (T.) | First season (2007/2008) | | | Second season (2008/2009) | | |
|-------------------|----------------------------|--------|-------|----------------------------|--------|-------|
| | Method of application (M.) | | | Method of application (M.) | | |
| | Spray | Drench | Mean | Spray | Drench | Mean |
| Control | 16.55 | 16.55 | 16.55 | 15.82 | 15.82 | 15.82 |
| Aloe | 18.90 | 20.60 | 19.75 | 18.64 | 21.42 | 20.03 |
| Garlic | 27.03 | 28.22 | 27.62 | 25.18 | 32.60 | 28.89 |
| Yeast | 23.48 | 26.85 | 25.17 | 24.90 | 25.91 | 25.40 |
| Henna | 17.01 | 19.55 | 18.28 | 18.90 | 19.50 | 19.20 |
| Mean | 20.59 | 22.35 | | 20.69 | 23.05 | |
| L.S.D. T. | 1.065 | | | 2.009 | | |
| L.S.D. M. | 0.674 | | | 1.271 | | |
| L.S.D. T. x M. | 1.507 | | | 2.842 | | |

seasons, respectively. The lowest record belonged to the untreated control plants (100.36 and 103.58 cm² in the second and first seasons, respectively). Concerning to the methods of application on leaf area, it was clear that the highest values (136.51 and 136.49 cm²) were obtained with drench method in the first and second seasons, respectively, while using spray method gave 131.30 and 124.86 cm² in the first and second seasons, respectively.

Thus the drench method was better than the spray method on increasing leaf area. Regarding the interaction between the extract types and the methods of application on leaf area, it was clear that all the interaction between all extract types and spray or drench methods increased leaf area as compared with the interaction between the control treatment and spray or drench methods in the two seasons, thus the greatest leaf area belonged to plants treated with garlic extract as soil drench (161.61 and 174.79 cm²) in the first and second seasons, respectively.

These results were in harmony with Desouky [25] stated that a combination of NPK at 100: 60: 20 g/plant + active dry yeast at 2 g/plant greatly increased leaf number/plant, leaf area on *Strelizia reginae*.

Total Carbohydrates Percentage: Data shown in Table 6 revealed that all the natural extracts, method of application and the interaction between them had a significant effect on total carbohydrates content. Regarding the effect of using natural extracts on total carbohydrates content, it is clear that the highest total carbohydrates content 27.62 and 28.89% were obtained with garlic extract in the first and second seasons, respectively, followed by using yeast extract which gave total carbohydrates content

25.17 and 25.40% in the first and second seasons, respectively, followed by aloe extract which resulted in 19.75 and 20.03% in the first and second seasons, respectively, followed by henna extract which gave 18.28 and 19.20% in the first and second seasons, respectively, whereas the lowest total carbohydrates (16.55 and 15.82%) were obtained with control treatment in the first and second seasons, respectively.

Concerning the effect of application method on total carbohydrates content, it is obvious that drench method was better than spray method for production total carbohydrates content in the two seasons, which drench method gave total carbohydrates 22.35 and 23.05% in the first and second seasons, respectively, while the spray method gave total carbohydrates content 20.59 and 20.69 % in the first and second seasons, respectively. Regarding the effect of interaction between extract type and methods of application on total carbohydrates content it is clear that the highest values (28.22 and 32.60%) were obtained with the interaction between garlic extract and drench method in the first and second seasons, respectively. Whereas the lowest total carbohydrates content (15.82 and 16.55%) were obtained with the interaction between control treatment and any methods of application in the two seasons.

These results were in agreement with those obtained by Hussain [26] on *Majorana hortensis* found that the highest value of total carbohydrates content was obtained due to the application of active dry yeast at 3 or 4.5 g/l. Ahmed and Safwat [27] reported that using active dry yeast at 6 g /l increased the photosynthetic pigments in leaves and total carbohydrates percentage in the herb of *Calendula officinalis*.

Table 7: Effect of extract treatments and application method on Nitrogen percentage (%) of *Schefflera arboricola*, during the seasons 2007/2008 and 2008/2009

| Extract type (T.) | First season (2007/2008) | | | Second season (2008/2009) | | |
|-------------------|----------------------------|--------|------|----------------------------|--------|------|
| | Method of application (M.) | | | Method of application (M.) | | |
| | Spray | Drench | Mean | Spray | Drench | Mean |
| Control | 0.48 | 0.48 | 0.48 | 0.49 | 0.49 | 0.49 |
| Aloe | 1.04 | 1.02 | 1.03 | 1.23 | 1.24 | 1.24 |
| Garlic | 1.34 | 1.48 | 1.41 | 1.56 | 1.54 | 1.55 |
| Yeast | 1.12 | 1.63 | 1.37 | 1.34 | 1.34 | 1.34 |
| Henna | 0.91 | 0.91 | 0.91 | 0.93 | 0.95 | 0.94 |
| Mean | 0.98 | 1.10 | | 1.11 | 1.11 | |
| L.S.D. T. | 0.057 | | | 0.038 | | |
| L.S.D. M. | 0.036 | | | N.S. | | |
| L.S.D. T. x M. | 0.08 | | | 0.054 | | |

Effect of Extract Types and Different Application Methods on Minerals Content

Nitrogen Percentage Content: Data presented in Table 7 indicated that all extract types (garlic, yeast, aloe and henna), the different methods of application and the interaction between them had a significant effect on nitrogen content in most cases. The highest nitrogen content (1.41 and 1.55 %) were produced with using garlic extract in first and second seasons, respectively, followed by using yeast extract which gave 1.37 and 1.34 % in the first and second seasons, respectively, then followed by using aloe extract which gave nitrogen content 1.03 and 1.24 % in the first and second seasons, respectively, then followed by using henna extract which gave nitrogen content 0.91 and 0.94 % in the first and second seasons, respectively. Whereas the lowest nitrogen content (0.48 and 0.49 %) were obtained with control treatment in the first and second seasons, respectively.

Concerning to the effect of different methods of application on nitrogen content, it is clear that the highest nitrogen content (1.11 and 1.11 %) were obtained with drench and spray methods in the second season followed by using drench method in the first season which produced nitrogen content 1.10 %. Regarding the effect of interaction between extract types and different methods of application on nitrogen content. It is obvious that the highest nitrogen content (1.63 and 1.56 %) were resulted in interaction between using yeast extract and drench method in the first season and interaction between garlic extract and spray method in the second season, respectively, followed by the interaction between garlic extract and drench method in the second season which gave nitrogen content 1.54 %.

Whereas the lowest nitrogen content (0.48 and 0.49 %) were produced with the interaction between control treatment and any methods of application in the first and second seasons, respectively. These results were

in agreement with those obtained by Noor EL-Deen [23] concluded that aqueous extract of garlic at 100% (250 cm garlic juice/l) or ethyl extract of garlic at 50% (125 cm garlic juice/l) increased nitrogen content of *Majorana hortensis*. Abbas [28] on *Narcissus tazetta* added that spray of the active dry yeast solution at the rate 6 g/l led to significant increase in N% in leaves and bulbs.

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