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Physiological Attributes of Cauliflower (*Brassica oleracea)* As Influenced by the Application of Different Levels of Nitrogen and Hand Weeding

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ABSTRACT

A field experiment was conducted at Vegetable Experimental area, Institute of Horticultural Sciences, University of Agriculture, Faisalabad during 2012-2013. Different vegetative, reproductive and biochemical components of cauliflower cultivar, Shumaila were studied. The vegetative components studied are Plant Height, Number of Leaves per plant, Leaf Area, Number of days to Curd formation and reproductive components are Curd area, Curd weight, Foliage fresh weight and Foliage dry weight. In this experiment the following treatments T_0 (Control), T_1 (Nitrogen) 50Kg ha^{-1} + hand weeding 30 days after sowing, T_2 (Nitrogen) 50Kg ha^{-1} + hand weeding 60 days after sowing, T_3 (Nitrogen) 50Kg ha^{-1} + hand weeding 90 days after sowing, T_4 (Nitrogen) 100Kg ha^{-1} + hand weeding 30 days after sowing, T_5 (Nitrogen) 100Kg ha^{-1} + hand weeding 60 days after sowing, T_6 (Nitrogen) 100Kg ha^{-1} + hand weeding 90 days after sowing, T_7 (Nitrogen) 150Kg ha^{-1} + hand weeding 30 days after sowing,T_8 (Nitrogen) 150Kg ha^{-1} + hand weeding 60 days after sowing, T_9 (Nitrogen) 150Kg ha^{-1} + hand weeding 90 days after sowing were observed. The biochemical components studied are chlorophyll contents, Vitamin C (mg/100ml). Treatment T_9 (Nitrogen 150Kg ha^{-1} + hand weeding 90 days after sowing) gave best results in all vegetative, reproductive and biochemical components and T_0 (Control) gave poor results in all traits.

Key words: *Cauliflower, Shumaila, Vegetative, Reproductive, Biochemical.*

INTRODUCTION

"Phool Ghobi" is the common name of cauliflower. It probably originated from Cyperus. It is grown for its tender, white head or curd. It is used in curries, soups and for pickles. It is rich in minerals, carbohydrates and vitamin A and C. It is one of the most important vegetable crop of cool season grown in Pakistan. Pakistan is included in top ten cauliflower producing countries in the world with 14400 hectares of harvested area, 193333 hecto gram/hectare of yield and 3090000 tons of production in 2012[1].

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The consumption of brassica sprouts as raw vegetables provides a fair amount of glucosinolates and active plant myrosinase, which enables the breakdown of glucosinolates into health-promoting isothiocyanates. This study reports the determination of the main constituents related to human health found in edible sprouts of two *Brassica oleracea* varieties. Measuring the release of plant isothiocyanates is a valuable tool in predicting the potential level of exposure to these bioactive compounds after the consumption of raw brassica sprouts[2]. Weeds are one of the limited factors in the crop production. A plant out of its proper place or any plant which is competing with cultivated plants or interfering the crop plant for its nutrition, light and man's legitimate activities is said to be a weed. Weeds are considered to be prolific, competitive, unwanted and harmful to the environment. Weeds are a great importance because can cause significant losses to crop yield[4,6].

Pratley[8] found that one of the advantages of hand weeding is that it allow the selective control of the other methods. The type and concentration of individual glucosinolates varied according to variety of *Brassica oleracea* plant parts in which they occurred and the sprouting period of the seed. Concentration of alkyl glucosinolates decreased whereas that of indol-3-methylglucosinolates increased throughout the sprouting period. He found that a number of hoe types are available and correct use of it is also an important to gain maximum yield.

Cauliflower was considered to be the latest addition of our vegetables further produced from green sprouting broccoli. Cabbage, cauliflower, broccoli and other vegetables of the group of cole crops were originated from the wild cabbage. However, difference between cauliflower and cabbage are that the floral part of the cauliflower is used for food instead of leaves. It is considered by some writers as improved type of broccoli. The edible portion or curd terminates the main stem. When the curd is fully matured the floral organ are not traceable. The floral primordial appears after the curd has passed its prime for harvesting. Later the branches elongate into flowering stalks causing the head to spread but many of the small branches abort[5].

MATERIALS AND METHODS

A research project captioned as physiological attributes of cauliflower (*Brassica oleracea var botrytis*) as influenced by the application of different levels of nitrogen and hand weeding was conducted at Vegetable Experimental Area, Institute of Horticultural Sciences, University of Agriculture, Faisalabad, during 2012-2013. The experiment was laid out according to Randomized Complete Block Design (RCBD) comprising of nine treatments (three nitrogen levels and three manual weeding) and three replications. Different physiological and morphological characteristics of cauliflower were studied and data analyzed statistically and analysis of variance tables were constructed to find out the significant levels of treatment on various parameters.

Materials for this study was consist of plants of cauliflower Shumaila late Cultivar, and different concentrations of Urea (Nitrogen) and hand weeding. The studied material was purchased from Dajkot Road. The crop was directly sown on well prepared bed. Row to row distance was 75 cm and plant to plant distance was 25 cm. There were 14 plants in each ridge. The crop was directly sown on well prepared bed on the ridges. Different concentrations and combinations of urea and Hand weeding were studied during the vegetative growth of cauliflower.

The experiment was laid out according to Randomized complete block design (RCBD) and replicated four times. The components to be studied are vegetative, reproductive and biochemical.

Statistical Analysis

The experiment was evaluated according to Randomized complete block design (RCBD) having treatments of various concentrations of urea and NPK. Each treatment was replicated three times. Mean values for various treatments indicating significant differences

will be compared using Duncan's Multiple Range Test (DMR) at 5% probability level[9].

RESULTS AND DISCUSSION

Effect of Nitrogen and hand weeding on vegetative components of cauliflower:

Vegetative components observed during this experiment (Table No. 1) like, plant height, number of leaves per plant, leaf area, number of days to curd formation. Results showed that treatment T_9 (Nitrogen 150Kg ha^{-1} + hand weeding 90 days after sowing) gave significant results for vegetative components plant height (72 cm), number of leaves per plant (18.66), number of days to curd formation (101), leaf area (675 cm^2) The poorest vegetative growth was recorded in components of plant height (45.34 cm), number of leaves per plant (14.00), number of days to curd formation (91.33), leaf area (311.33 cm^2) T_0 (control). The treatment T_9 (Nitrogen 150Kg ha^{-1} + hand weeding 90 days after sowing) that received collective nitrogen and hand weeding showed improved results as compared to single nitrogen or hand weeding that could be due to high nitrogen level and less competition of weeds. The results are in accordance with the findings of Mishra *et al*[7].

Table 1: Effect of different levels of Nitrogen and hand weeding on vegetative components of cauliflower

Treatments	Plant height (cm)	No. of leaves	No. of days to curd formation	Leaf area (cm^2)
T_0	45.34h	14.00d	91.33a	311.33g
T_1	49.34g	14.00d	92.33ab	368.00fg
T_2	53.68f	14.00d	93.33ab	419.67ef
T_3	56.00f	14.33cd	95.22abc	447.67def
T_4	60.34e	14.66cd	95.33abc	501.67cde
T_5	65.00d	15.00cd	95.11ab	521.67cd
T_6	66.67cd	16.00bc	98.00a	546.00bc
T_7	68.34bc	17.00ab	99.00ab	624.67ab
T_8	69.68ab	18.33a	99.00abc	650.00a
T_9	72.00a	18.66a	101.00a	675.00a
Means	60.639	15.598	86.065	506.56

*Means followed by the same letter in a column do not differ significantly at $p< 0.05$

Effect of Nitrogen and hand weeding on reproductive of cauliflower:

Reproductive components observed during this experiment (Table No. 2) like, foliage fresh weight, foliage dry weight, curd area, curd weight. Results showed that treatment T_9 (Nitrogen 150Kg ha^{-1} + hand weeding 90 days after sowing) gave significant results for reproductive components of foliage fresh weight (1.152 g), foliage dry weight (268.33 g), curd area (23.190 cm^2), curd weight (1.1933g). The poorest reproductive growth was recorded in components of foliage fresh weight (0.8833 g), foliage dry weight (236 g), curd area (15.39 cm^2), curd weight (0.920 kg) T_0 (control). The treatment T_9 (Nitrogen 150Kg ha^{-1} + hand weeding 90 days after sowing) that received collective nitrogen and hand weeding showed improved results as compared to single nitrogen or hand weeding that could be due to high nitrogen level and less competition of weeds.

Table 2: Effect of different levels of Nitrogen and hand weeding on reproductive components of cauliflower

Treatments	Foliage Fresh weight (g)	Foliage Dry weight (g)	Curd area (cm^2)	Curd weight (Kg)
T_0	0.8833h	236.00f	15.397d	0.9200d
T_1	0.9167gh	240.00ef	18.057c	1.0233c
T_2	0.9467fg	242.67def	18.807c	1.0300c
T_3	0.9567efg	246.33de	19.373c	1.0333c
T_4	0.9833ef	246.67de	21.397b	1.0900bc
T_5	1.0067de	249.33cd	21.927ab	1,0767bc
T_6	1.0400cd	254.67bc	22.263ab	1.1100abc
T_7	1.0900bc	261.00ab	22.337ab	1.1667ab
T_8	1.1333ab	265.33a	23.050ab	1.1733ab
T_9	1.1523a	268.33a	23.190a	1.1933a
Means	0.903	250.93	20.575	1.079

*Means followed by the same letter in a column do not differ significantly at $p< 0.05$

Effect of Nitrogen and hand weeding on biochemical components of cauliflower:

Biochemical components observed during this experiment (Table No. 3) like, Chlorophyll contents (CCI), Vitamin C (mg). Results showed that treatment T_9 (Nitrogen 150Kg ha^{-1} + hand weeding 90 days after sowing) gave significant results for biochemical components of Chlorophyll contents (181.08 CCI), Vitamin C (37.33 mg). The poorest vegetative growth was recorded in components of Chlorophyll contents (109.07 CCI), Vitamin C (20.58 mg) T_0 (control). The treatment T_9 (Nitrogen 150Kg ha^{-1} + hand weeding 90 days after sowing) that received collective nitrogen and hand weeding showed improved results as compared to single nitrogen or hand weeding that could be due to high nitrogen level and less competition of weeds. The results are in accordance with the findings of Karitonas[3] and Villeneuve *et al*[10].

Table 3: Effect of different levels of Nitrogen and hand weeding on biochemical of cauliflower

Treatments	Chlorophyll contents (CCI)	Vitamin C in (mg)
T_0	109.07d	20.580d
T_1	116.82cd	21.843d
T_2	117.54cd	23.910bcd
T_3	126.26cd	24.443abcd
T_4	133.05cd	26.550abcd
T_5	136.31cd	28.443abcd
T_6	142.87bc	29.660abc
T_7	163.62ab	33.897abc
T_8	163.75ab	36.653ab
T_9	181.08a	37.337a
Means	139.03	27.729

*Means followed by the same letter in a column do not differ significantly at $p< 0.05$.

CONCLUSION

In this experiment the effect of different levels of Nitrogen and hand weeding were studied in cauliflower. The treatment T_9 (Nitrogen 150Kg ha^{-1} + hand weeding 90 days after sowing) gave best results in vegetative, reproductive and biochemical. In all components like vegetative, reproductive and biochemical, T_0 (control) gave poor results in all components.

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