

# Influence of gibberellin on biometric and yield parameters of winged bean [*Psophocarpus tetragonolobus* (L.) DC.]

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Received : May, 2011; Accepted : July, 2011

## SUMMARY

The gibberellin concentration increased the vegetative and yield parameters of winged bean [*Psophocarpus tetragonolobus* (L.) DC.]. The increase was directly proportional to the concentrations (25ppm, 50ppm, 75ppm, and 100ppm) used. The experiment was conducted on vegetative growth (on both 40<sup>th</sup> and 60<sup>th</sup> days after sowing). Gibberellin increased the shoot length, root length, petiole length, inter-nodal length, number of leaves, number of nodules and volume of nodules in all the concentrations. The pod length, pod circumference, pod weight (except at 25ppm), number of seeds/pod and weight of seeds/pod increased significantly in all the concentrations and it was directly proportional to the applied concentrations.

Vijayalakshmi, A. and Singh, Anju (2011). Influence of gibberellin on biometric and yield parameters of winged bean [*Psophocarpus tetragonolobus* (L.) DC.]. *Internat. J. Plant Sci.*, 6 (2): 358-361.

**Key words :** Gibberellin, *Psophocarpus tetragonolobus*, Vegetative, Yield parameters

Gibberellic acid is a naturally occurring plant hormone that stimulates and regulates plant growth known as GA<sub>3</sub>, this hormone promotes cell division and elongation, resulting in a taller plant. This plant growth hormone was discovered in 1920, when Kurosawa, a Japanese research worker was investigating the "bakanae" (foolish seedling) disease of rice caused by the fungus *Gibberella fujikuroi*. The fungus secreted some substances which stimulates the stem and leaf elongation. Yabuta (1941) at the University of Tokyo assigned the name "gibberellin" to the active factor. With the discovery of gibberellin, in 1920, a considerable body of information has emerged regarding the roles this hormone play in plant growth and development.

Gibberellins have been primarily used for manipulating production practices and ensuring the quality of high value crops such as grapes, citrus, cherries and apples increasing the market demands. This hormone was selected for the present investigation in order to improve the quality and quantity of winged bean [*Psophocarpus tetragonolobus* (L.) DC.]. Winged bean has recently attracted world attention as a potential crop of high

nutritional value.

## MATERIALS AND METHODS

Seeds of *Psophocarpus tetragonolobus* (L) DC. purchased from the seed centre, Tamil Nadu Agriculture University, Coimbatore was used for the experiments. Two sets of experiments were conducted. The investigations were carried out in the experimental plots of Avinashilingam Deemed University.

### Experiment I :

For studying the morphometric characters of winged beans during midvegetative growth, the seeds were sown in pots. Gibberellin at different concentrations (25ppm, 50ppm, 75ppm, 100ppm) was sprayed twice at an interval of 10 days. On the 40<sup>th</sup> and 60<sup>th</sup> day, the plants were uprooted carefully from the plots and the following characters were studied.

- Shoot length
- Root length
- Petiole length
- Internodal length
- Number of leaves
- Number of nodules
- Volume of nodules

### Experiment-II:

To study the seed and pod characters of winged beans, the seeds were sown in statistically designed randomized compact blocks in the research field of

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Avinashilingam Deemed University and investigations on pod and seed characters were carried out. Gibberellin was sprayed thrice at an interval of 15 days at flowering stage. 20 pods at random were collected from each concentration and the following characters were statistically analyzed.

- Pod length
- Pod circumference
- Pod weight
- Number of seeds/pod
- Weight of seeds/pod.

## RESULTS AND DISCUSSION

### Experiment - I:

On the 40<sup>th</sup> and 60<sup>th</sup> day after sowing the seeds of winged bean, the biometrical parameters like root length, shoot length, petiole length, internodal length, number of leaves, number of nodules and volume of nodules as influenced by application of gibberellin was observed. The result obtained for the 40<sup>th</sup> day plants are shown in Table 1.

#### Shoot length:

The shoot length of the plants increased significantly with the application of gibberellin. A significant increase in the length of the shoot of winged bean was noted on all the treatments 25ppm (77.2cm), 50ppm (87.8 cm), 75ppm (97.3 cm) and 100ppm (113 cm) when compared with the control (58 cm).

#### Root length:

Root length increased significantly at 25ppm (46.6cm), 50ppm (52.9cm), 75ppm (61.6 cm) and 100ppm (75.3cm) when compared to the control (40.3cm).

#### Petiole length:

Significant increases of the petiole length in all concentrations were noted, compared to the control (2.77cm). The highest being at 100ppm (3.9cm). The petiole length treated with gibberellin increased

significantly in the present study.

#### Internodal length:

Internodal length of winged bean increased significantly at all the concentrations of gibberellin. The internodal length increased with the increase in concentration.

#### Number of leaves:

All the treatments increased the number of leaves of winged bean (25ppm-42.7, 50ppm-50.3, 75ppm-55.6 and 100ppm-60.2) when compared with the control (38.3cm).

#### Number and volume of nodules:

Regarding the number and volume of nodules, the gibberellin treatment revealed a significant increase with all the concentrations (25ppm, 50ppm, 75ppm, and 100ppm) when compared with the control. The results of the 60<sup>th</sup> day plants treated with gibberellin are shown in Table 2.

#### Shoot length:

Significant increase in the shoot length of winged bean at 60 days after sowing was noted. The shoot length were increases with increased concentration of gibberellin (25ppm-76.1cm, 50ppm-87.7cm, 75ppm-102cm and 100ppm-117.9cm) when compared with the control (72cm).

#### Root length:

Gibberellin showed an appreciable increase in the result obtained for the root length of winged bean. All the treatments (25ppm, 50ppm, 75ppm, and 100ppm) significantly increased the root length and the highest length was at 100ppm (85.7cm) when compared with the control (48.9cm).

#### Petiole length:

Regarding the petiole length, all the treatments

**Table 1 : Effect of gibberellin on vegetative characters of winged bean (40 Days)**

	Control	25ppm	50ppm	75ppm	100ppm	S.E	C.D
Shoot length	58.2	77.2	87.8	97.3	113	8.90	7.76
Root length	40.3	46.6	52.9	61.6	75.3	5.89	5.12
Petiole length	2.77	2.83	3.4	3.7	3.9	0.49	0.43
Internodal length	1.9	2.4	2.9	2.9	3.3	0.38	0.33
Number of leaves	38.3	42.7	50.3	55.6	60.2	5.18	4.51
Number of nodules	8.8	11.8	16.0	20.6	24.8	20.86	2.51
Volume of nodules	0.15	0.16	0.21	0.24	0.3	0.04	0.03

**Table 2 : Effect of gibberellin on vegetative characters of winged bean (60 Days)**

	Control	25ppm	50ppm	75ppm	100ppm	S.E	C.D
Shoot length	72	76.1	87.7	102	117.9	9.29	8.10
Root length	48.9	62.6	68.6	76.4	85.7	5.70	4.97
Petiole length	7.7	8	8.3	8.8	9.6	0.44	0.39
Internodal length	3.1	3.7	3.7	9.0	11.6	1.49	1.30
Number of leaves	74	75	78.1	82.0	83.6	4.02	3.50
Number of nodule	14.0	16	19	25.7	27.0	2.63	2.29
Volume of nodules	0.15	0.2	0.2	0.24	0.24	0.03	0.02

(25ppm-72cm, 50ppm-75cm, 75ppm-79.5cm, and 100ppm-86cm) showed a significant increase when compared with the control (69.5cm).

#### Internodal length:

Gibberellin treatment significantly raised the internodal length of the winged bean at all the concentrations 25ppm-3.7cm, 50ppm-3.7cm, and 75ppm-9cm, the highest was at 100ppm (11.6cm) when compared with the control (3.1cm).

#### Number of leaves:

There was a significant increase in the number of leaves influenced by gibberellin. All the treatments (25ppm-75, 50ppm-78, 75ppm-82 and 100ppm-83.6 showed an increase when compared with the control (74cm). As in present study, increase in number of leaves was noted by Haque (2001) in garlic cloves (*Allium sativum* L.).

#### Number and volume of nodules:

Gibberellin treatment increased significantly the number and volume of nodules in all the treatments (25ppm, 50ppm, 75ppm and 100ppm) when compared with the control.

#### Experiment-II:

The effect of gibberellin on the characters such as pod length, pod circumference, pod weight, number of seeds/pod, and weight of seeds/pod were studied and the results are shown in the Table 3.

#### Pod length:

The pod length increased significantly at 25ppm (14.21cm), 50ppm (15.37cm), 75ppm (16.72cm) and 100ppm (18.35cm) when compared with the control (13.29cm). The result is in agreement with the result of Batlang (2008) in hot pepper (*Capsicum annum* L.).

#### Circumference of pod :

A significant increase in the circumference of pod was noted in all the treatments, 25ppm (7.5cm), 50ppm (7.7cm), 75ppm (7.7cm) and 100ppm (8.6cm) when compared with the control (7.16cm).

#### Pod weight :

The pod weight increased significantly at 25ppm (14.16g), 50ppm (15.28 g), 75ppm (18.62g) and 100ppm (20.75g) when compared with the control (12.53g). As in the present study, the yield parameters were increased with the treatment of gibberellin in kalazira (*Bunium persicum* Linn.) by Kausal and Usha Rana (2005).

#### Number of seed/pod :

The number of seeds/pod increased at 25ppm (6.27), 50ppm (6.53), 75ppm (8.13) and 100ppm (10.4) when compared with the control (5.27). As in the present study, the yield parameters were increased with the treatment of gibberellin in chickpea (*Cicer arietinum*) by Srivastava et al. (2001).

#### Weight of seed/pod:

The weight of the seeds/pod increased with the

**Table 3 : Effect of gibberellin on yield parameters of winged bean (120 days)**

	Control	25ppm	50ppm	75ppm	100ppm	S.E	C.D
Pod length	13.29	14.21	15.37	16.72	18.35	1.67	0.88
Pod circumference	7.16	7.45	7.71	7.67	8.55	0.46	0.24
Pod weight	12.53	14.16	15.28	18.62	20.75	1.98	1.04
Number of seed/Pod	5.27	6.27	6.53	8.13	10.4	0.92	0.48
Weight of seed/Pod	3.17	2.71	3.24	4.43	5.52	0.87	0.45

concentration of the gibberellin used and the most significant result obtained at 100ppm (5.52g) when compared with the control (3.17g). But there was a slight

decrease in 25ppm (2.71g). The results were in agreement with the findings of Khan *et al.* (2002) in Indian mustard.

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