# EFFECT OF NEWLY SYNTHESIZED CHLOROSUBSTITUTED HETEROCYCLES ON SEED GERMINATION OF SOME RABBI CROPS

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**Abstract :** Agronomy[1] is considered as the mother or primary branch of agriculture. The central theme of agronomy is of soil-crop-environment relationship. Thus, in short agronomy is the study of how plants and soil can be best used for food, fuel, fiber and reclamation. . Indian farmer have given special attention to the vegetative growth and disease controlling management of plants. Various experiments reported that the application of micro nutrients in the field is useful to promote vegetative growth as well as crop yield. Various researchers studied the effect of compounds on seed germination i.e. root and shoot elongation and consequently crop yields.

Keywords - Chlorosubstituted heterocycles, Growth promoting effect , Rabbi crop plants

## I. INTRODUCTION

Indian farmers have given special attention to the vegetative growth and disease controlling management of plants. In modern agricultural practices, chemicals are sprayed on crop plants to accelerate the plant growth. Many plant growth promoting compounds are commercially available in the market. The growth of plant is controlled by the number of organic substances like Indole acetic acid, auxines, gibberlines and some chlorosubstituted heterocyclic compounds which act as growth promoting hormones.[2-5] Nature has provided us with lots of diseases preventing compounds. Literature survey reveals that heterocycles have insecticidal ,fungicidal ,antimicrobial activities in vitro as well as in vivo conditions. The effectiveness[6-7] of these techniques for reducing seedling diseases in *cotton, soyabean* and *snap bean* have been reported by researchers and detected no adverse effect of the solvent alone. From the literature survey, it is evident that chlorosubstituted heterocycles have a very board spectrum of fungicidal, insecticidal and growth promoting hormonal effect on crop plants. In this context, effect of some compounds such as anthracene[8], coumarin[9], methyl tertiary butyl ether[10], nitric oxide[11], ethyl acetate and acetone[12], dichloromethane[13], auxins on seed

germination were reported growth promoting effect on agricultural crop plants[15], flowering plants[16] and horticultural[17] crop plants were also reported in the literature.. So, we thought it interesting to undertake the study of the chlorosubstituted thiazines, thiazoles, triazines, triazoles compounds on some *rabbi crops* plant viz. *Pisum sativum, Zea mays, Brassica juncea and Lenus culinaris* with special reference to their growth promoting and disease controlling impact.

# II. EXPERIMENTAL

The present investigation was focused on the study of the effect of chlorosubstituted heterocycles on root and shoot elongation in the test plants. In this part of the study the effect of titled compounds on seed germination has been studied. The suspensions of titled compounds were used for the treatment of test plant seeds viz. *Pisum sativum, Zea mays, Brassica juncea and Lenus culinaris*. The rate of germination recorded by measuring the length of root and height of shoot of test plants after every 24 hours and continued for next 45 days. In this regard experimental setup of the study was divided into following two parts i) Seed Treatment ii) Field Experiments

The best quality seeds were procured from Krishi Vidyan Kendra (KVV), Durgapur, Badnera (M.S.).

**i) Seed Treatment**

Seed treatment is helpful in following ways -

1. It is helpful in controlling seed borne diseases.
2. It protects seed from damage by soil insects in the field.
3. It protects seeds from seed and seedling rots caused by *phythium* and *rhizoctonia* commonly present in soil.
4. It protects against damage by pests.
5. With a view to safe guard dormant seed potential from harmful external agencies, the seeds of test plants were treatment by test compounds before souring.

**ii) Field Experiments**

The plants were divided into two groups as controlled and treated group plants. The seed from controlled group were soaked in water for 10h whereas the seeds from treated group were soaked separately in the suspensions of the titled compounds for 10h. The concentrations of solutions used for these experiments were 1mg/ml. Then the seeds were placed in the beds of cocopeat in different sets specially made and labelled for the study. They were periodically irrigated.

The observations were recorded as regard to elongation of roots and increase in shoot heights. Average length of radicals and plumules were observed after every 24h upto next 30 days. The comparisons were made between controlled and treated group plants with reference to their elongation of roots and increase in shoot heights.

The observation readings were recorded in Table No. aii, aiii and aiv. The observed data obtained as on 7th, 15th and 30th days was subjected to analysis of percentage of germination with special reference to growth parameters such as shoot height and root elongation.

**Table No. ai**

**List of the compounds tested for their effect on seed germination**

| Sr. No. | Compound | Name of Compound |
|---|---|---|
| 1. | IVa | 4-(2-Hydroxy-3,5-dichlorophenyl)-6-hydroxyphenyl-2-imino-3,6-dihydro- 1,3-thiazine |
| 2. | IVb | 4-(2-Hydroxy-3,5-dichlorophenyl)-6-phenyl-2-iminophenyl-3,6-dihydro-1,3-thiazine |
| 3. | VIIIa | 2-Amino-4-(2-hydroxybenzoyl)-5-(2-hydroxy-3,5dichloro phenyl)-1,3-thiazole |
| 4. | VIIIb | 2-Aminophenyl-4-(2-hydroxybenzoyl)-5-(2-hydroxy-3,5 dichlorophenyl)-1,3-thiazole |
| 5. | XIIIa | 2,4-Bis-(phenylamino)-6-[4'-{5"-(3"',5"'-dichlorophenyl)-isoxazole-3"-yl}-phenylamino]-1,3,5-triazine |
| 6. | XIIIb | 2,4-Bis-(phenylamino)-6-[4'-{5"-(4"'-chlorophenyl)-isoxazole-3"-yl}-phenylamino]-1,3,5-triazine |
| 7. | XVI | 1-[1-(2-Chloronapthalen-l-yl)]-4-acetyl-5-methyl-1,2,3-triazole |
| 8. | XVII | 1-[1-(1-Chloronapthalen-2-yl)]-4-acetyl-5-methyl-1,2,3-triazole |

**Table aii**

**Effect of titled compounds on seed germination, length of radical and length of *plumule of Pisum sativum, Zea mays, Brassica juncea and Lenus culinaris* on 7th Day**

| S.No. | Compound | *Pisum sativum* | | | *Zea mays* | | | *Brassica juncea* | | | *Lenus culinaris* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | % Germi-nation | Avg. length of radicle (cm) | Avg. length of plumule (cm) | % Germi-nation | Avg. length of radicle (cm) | Avg. length of plumule (cm) | % Germi-nation | Avg. length of radicle (cm) | Avg. length of plumule (cm) | % Germi-nation | Avg. length of radicle (cm) | Avg. length of plumule (cm) |
| 1. | Control | 45 | 2.61 | 2.71 | 50 | 2.86 | 2.96 | 54 | 1.90 | 1.77 | 48 | 2.81 | 2.85 |
| 2. | Iva | 84 | 4.74 | 6.02 | 80 | 4.56 | 5.36 | 90 | 2.80 | 2.62 | 80 | 4.60 | 5.20 |
| 3. | IVb | 87 | 4.66 | 5.77 | 90 | 5.39 | 5.26 | 92 | 2.90 | 2.82 | 95 | 4.72 | 5.45 |
| 4. | VIIIa | 88 | 4.91 | 5.22 | 85 | 4.60 | 5.02 | 87 | 3.91 | 3.00 | 87 | 4.90 | 5.36 |
| 5. | VIIIb | 90 | 5.18 | 5.41 | 90 | 4.81 | 5.40 | 94 | 3.33 | 3.81 | 88 | 5.01 | 5.29 |
| 6. | XIIIa | 91 | 6.00 | 6.24 | 96 | 7.96 | 8.24 | 95 | 3.74 | 4.61 | 90 | 6.30 | 6.02 |
| 7. | XIIIb | 96 | 7.16 | 6.11 | 95 | 9.05 | 8.20 | 97 | 3.52 | 4.72 | 92 | 7.94 | 8.72 |
| 8. | XVI | 97 | 6.72 | 6.24 | 93 | 8.60 | 8.01 | 96 | 5.12 | 5.61 | 94 | 88.01 | 8.67 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9. | XVII | 93 | 7.01 | 6.73 | 94 | 8.71 | 8.10 | 92 | 5.42 | 5.85 | 96 | 8.61 | 8.16 |

**Table aiii**

**Effect of titled compounds on seed germination, length of radical and length of plumule of *Pisum sativum, Zea mays, Brassica juncea and Lenus culinaris* on 15th Day**

| S.No. | Compound | *Pisum sativum* | | | *Zea mays* | | | *Brassica juncea* | | | *Lenus culinaris* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | % Germi-nation | Avg. length of radicle (cm) | Avg. length of plumule (cm) | % Germi-nation | Avg. length of radicle (cm) | Avg. length of plumule (cm) | % Germi-nation | Avg. length of radicle (cm) | Avg. length of plumule (cm) | % Germi-nation | Avg. length of radicle (cm) | Avg. length of plumule (cm) |
| 1. | Control | 45 | 2.80 | 2.92 | 50 | 2.96 | 2.98 | 54 | 2.06 | 2.77 | 48 | 2.88 | 2.93 |
| 2. | Iva | 84 | 5.24 | 6.32 | 80 | 4.95 | 5.54 | 90 | 3.04 | 2.81 | 80 | 4.70 | 5.34 |
| 3. | IVb | 87 | 5.01 | 5.98 | 90 | 5.87 | 5.47 | 92 | 3.03 | 3.26 | 95 | 4.98 | 5.98 |
| 4. | VIIIa | 88 | 5.15 | 6.02 | 85 | 5.03 | 5.22 | 87 | 3.85 | 4.12 | 87 | 5.09 | 5.62 |
| 5. | VIIIb | 90 | 5.46 | 5.61 | 90 | 5.15 | 5.91 | 94 | 3.16 | 4.25 | 88 | 5.11 | 5.39 |
| 6. | XIIIa | 91 | 6.12 | 6.08 | 96 | 8.44 | 8.65 | 95 | 3.82 | 4.72 | 90 | 8.60 | 6.24 |
| 7. | XIIIb | 96 | 7.24 | 6.45 | 95 | 9.56 | 7.42 | 97 | 3.65 | 4.81 | 92 | 7.99 | 9.12 |
| 8. | XVI | 97 | 7.54 | 6.90 | 93 | 9.62 | 8.13 | 96 | 5.88 | 5.86 | 94 | 8.21 | 8.87 |
| 9. | XVII | 93 | 7.41 | 6.83 | 94 | 9.16 | 8.56 | 92 | 5.98 | 5.90 | 96 | 8.81 | 8.90 |

**Table aiv**

**Effect of titled compounds on seed germination, length of radical and length of *plumule of Pisum sativum, Zea mays, Brassica juncea and Lenus culinaris* on 30th Day**

| S.No. | Compound | *Pisum sativum* | | | *Zea mays* | | | *Brassica juncea* | | | *Lenus culinaris* | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | % Germi-nation | Avg. length of radicle (cm) | Avg. length of plumule (cm) | % Germi-nation | Avg. length of radicle (cm) | Avg. length of plumule (cm) | % Germi-nation | Avg. length of radicle (cm) | Avg. length of plumule (cm) | % Germi-nation | Avg. length of radicle (cm) | Avg. length of plumule (cm) |
| 1. | Control | 45 | 2.86 | 2.94 | 50 | 2.97 | 2.99 | 54 | 2.16 | 2.92 | 48 | 2.94 | 3.02 |
| 2. | Iva | 84 | 5.85 | 6.94 | 80 | 5.15 | 5.68 | 90 | 3.40 | 3.04 | 80 | 5.02 | 5.69 |
| 3. | IVb | 87 | 5.42 | 6.04 | 90 | 5.96 | 5.59 | 92 | 3.33 | 3.46 | 95 | 5.16 | 6.12 |
| 4. | VIIIa | 88 | 5.59 | 6.52 | 85 | 5.18 | 5.43 | 87 | 3.98 | 4.42 | 87 | 5.49 | 5.96 |
| 5. | VIIIb | 90 | 5.69 | 5.84 | 90 | 5.45 | 6.01 | 94 | 4.03 | 4.52 | 88 | 5.48 | 6.24 |
| 6. | XIIIa | 91 | 6.26 | 6.80 | 96 | 8.82 | 8.96 | 95 | 3.82 | 4.94 | 90 | 9.09 | 6.84 |
| 7. | XIIIb | 96 | 7.49 | 6.88 | 95 | 9.72 | 8.03 | 97 | 4.92 | 5.04 | 92 | 8.02 | 9.69 |
| 8. | XVI | 97 | 7.84 | 7.24 | 93 | 9.78 | 9.13 | 96 | 6.09 | 6.94 | 94 | 8.61 | 9.17 |
| 9. | XVII | 93 | 7.80 | 7.14 | 94 | 9.36 | 8.69 | 92 | 6.24 | 6.74 | 96 | 9.02 | 8.14 |

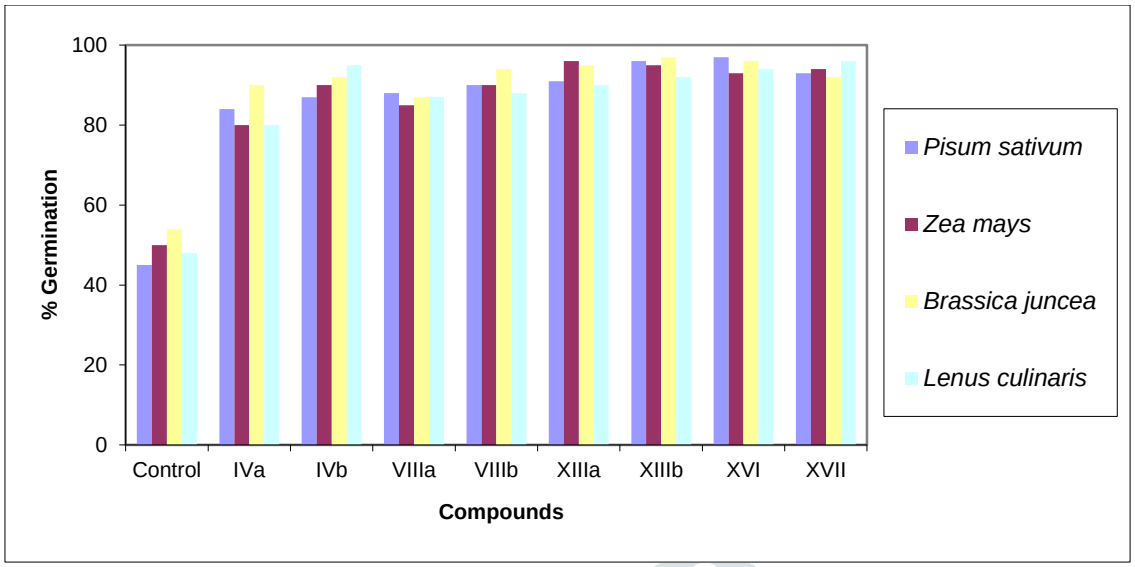



**Fig. ai : Graphical representation of percentage germination**

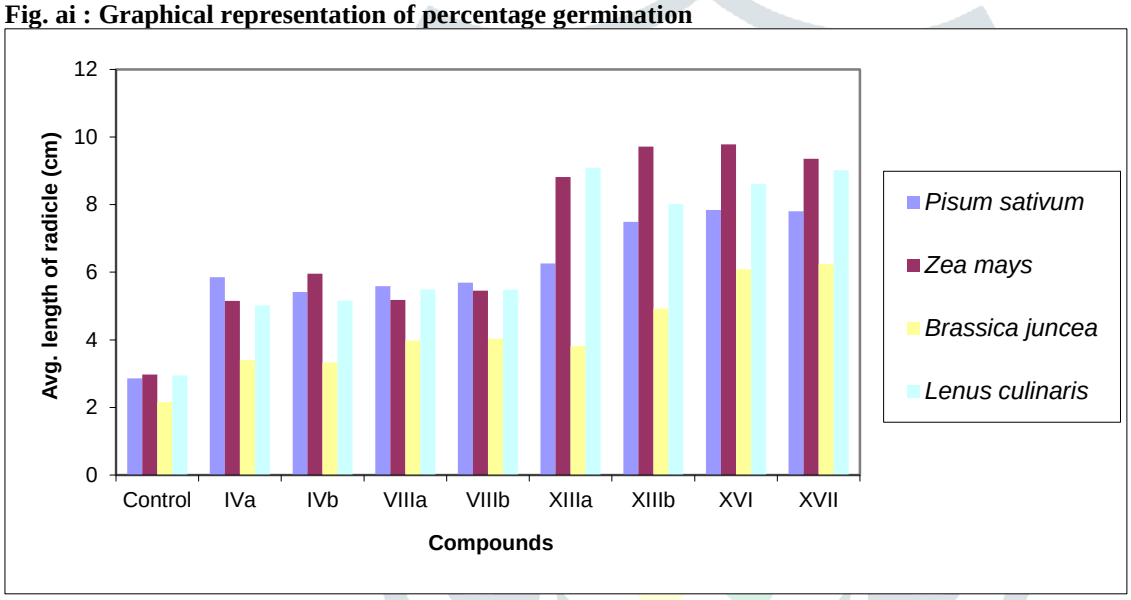



**Fig. aii : Graphical representation of length of radical on 30$^{th}$ day**

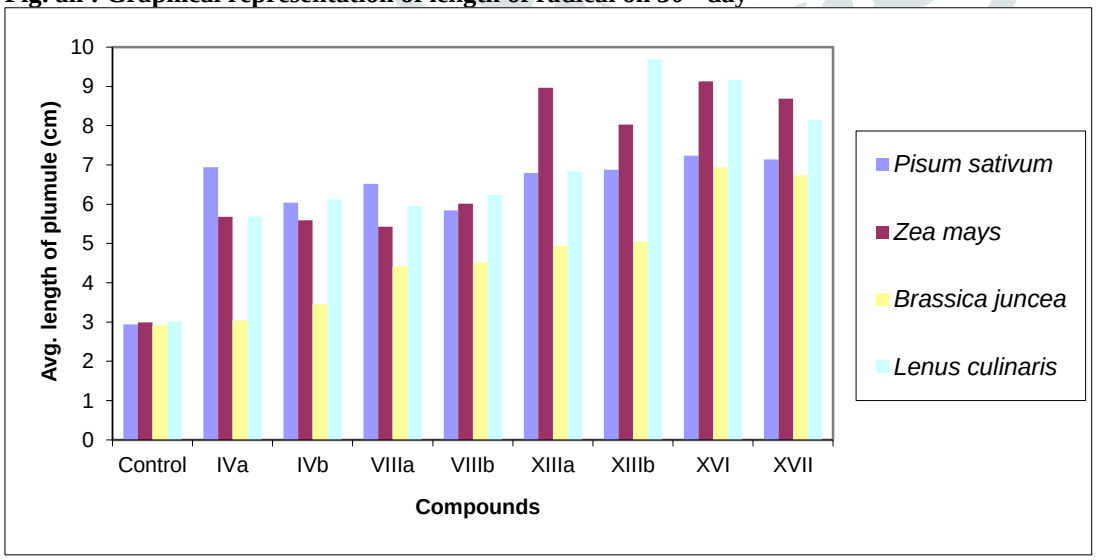


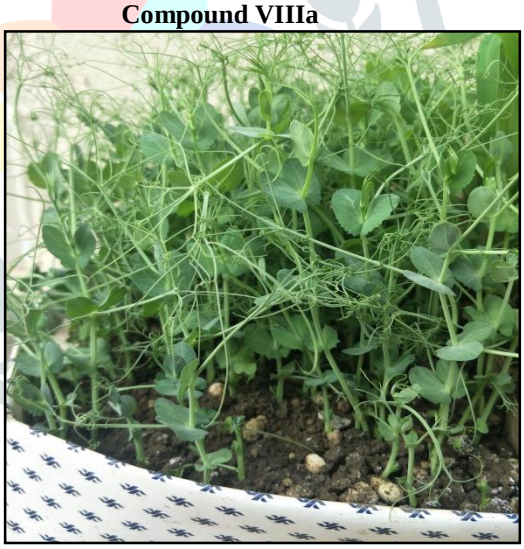

**Fig. aiii : Graphical representation of length of plumule on 30$^{th}$ day**

**Control**

**Compound IVa**

**Compound VIIIa**

**Compound XIIIa**



**Compound XVI**

**Fig. aiv : Effect of titled compounds on Seed Germination**
***Pisum sativum* (Pea) Seeds on 30th day**

**Control**

**Compound IVa**

**Compound VIIIa**

**Compound XIIIa**

**Compound XVI**

**Fig. av : Effect of titled compounds on Seed Germination**
***Zea mays* (Maize) Seeds on 30th day**

**Control**

**Compound IVa**

**Compound VIIIa**

**Compound XIIIa**

**Compound XVI**

**Fig. avi : Effect of titled compounds on Seed Germination**
***Brassica juncea* (Rai) Seeds on 30th day**

**Control**

**Compound IVa**

**Compound VIIIa**

**Compound XIIIa**

**Compound XVI**

**Fig. avii : Effect of titled compounds on Seed Germination**
***Lenus culinaris* (Chana) Seeds on 30th day**

## III. DISCUSSION OF THE RESULTS

The present study was aimed at impact of newly synthesized chlorosubstituted heterocycles on some *Rabbi crops* viz. *Pisum sativum, Zea mays, Brassica juncea and Lenus culinaris*. The choice of these crops was detected by their enormously vast utility and indispensability for the survival of the human

race, all across the globe. It would be a great service to the mankind if the compounds synthesized in the present research promote the growth and enhance the yield of the crop plants.

The efforts have been made to investigate and analysis the convergence and divergence of the effects of test compounds on the morphology of plants under investigation.

In the present study comparison of morphological characters of controlled and treated group plants, it was interesting to note that the treated group plants exhibit significant improvement in shoot heights and elongation of roots as compared to control group plants. Analysis of seed germination study of titled compounds clearly showed that there was good percentage of germination, enhancement in growth of shoot as well as root heights in all treated plants.

When all the treated plants were compared among themselves it was distinctly seen that morphological change in *Zea mays* was dominant than other three test plants. More detailed results showed that the chlorosubstituted heterocyclic compounds synthesised were found very effective in the enhancement of morphological characters.

While analyzing seed germination results, it was seen that there was a great difference between the percentage germination of control group plants and treated group plants. In general, compounds XIIIa, XIIIb, XVI and XVII showed good effects on percentage germination. Particularly, compound IVb showed very good results in case of all the four groups of treated plants. Compound XIIIa showed excellent results in *Zea mays* and *Brassica juncea* test plants. In case of *Pisum sativum* compound XVI, in *Zea mays* XIIIa, in *Brassica juncea* XIIIb and in case of *Lenus culinaris* compound XVI showed highest percentage of germination.

All the treated group plants showed a remarkable enhancement in the radical length than the control group plants. In the analysis of results of the radical length, compound XVI showed excellent germination in case of *Pisum sativum* and *Zea mays* plants. In case of *Brassica juncea* compound XVI was the most effective and in case of *Lenus culinaris* compound XIIIa showed excellent results. In general compounds IVa, IVb and VIIIa showed moderate impact, compounds VIIIb and XIIIa showed good effects and compounds XIIIb, XVI and XVII showed very good impact on radical as well as plumule germination.

*Zea mays* showed on excellent growth results of plumule with compound XIIIa, whereas compound XVI in case of *Pisum sativum*, Compound XVII in case of *Brassica juncea* and compound XIIIb in case of *Lenus culinaris* plants showed excellent impact on plumule growth. In the plumule

length analysis, compound XVI gave appreciable results in all the treated group plants whereas compound IVa and IVb showed moderate results.

From the above discussion it was concluded that the effects of titled compounds were significant in all the treated group plants as compared to controlled group plants. However, further detailed study in the light of agricultural sciences especially for their disease controlling activities in plants would certainly prove to be beneficial tool for service to the society.

There has been fair amount of satisfaction in carrying out the present study. The encouraging results have surely contributed to the enthusiasm of the author.

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