Available online at www.pelagiaresearchlibrary.com

Pelagia Research Library

Der Chemica Sinica, 2013, 4(2):148-151

Pelagia Research Library
ISSN: 0976-8505
CODEN (USA) CSHIA5

Studies on the effect of some thiosemicarbazides on the germination pattern of *Brassica campestris* (L.)

M. S. Wagh[a*], P. S. Agrawal[b], L. J. Paliwal[c], C. S. Bhaskar[d] and N. Berad[c]

[a]*Department of Chemistry, Kamla Nehru Mahavidyalaya, Nagpur (M.S), India*
[b]*Dr. I. N. Nimdeokar P. G. & Research Centre for Chemistry, Hislop College, Nagpur (M.S.), India*
[c]*Department of Chemistry R.T.M. Nagpur University, Mahatma Jyotiba Phule Educational Campus, Nagpur (M.S.), India*
[d]*Department of Chemistry, Arts, Commerce and Science College, Koradi, Nagpur (M.S.), India*

ABSTRACT

Thiosemicarbazides have found to contain antimicrobial, antimycobacterial activity, antiviral activities against various virus, bacteria and fungi strains. The objective of the study was to determine the seed germination and physiological maturity stage of Brassica campestris (L.). Speed of germination index, Vigor index, root length, shoot length and dry matter were determined after 10 days treatment. These factors are affected by different condition.

Keywords: Speed of germination index, vigor Index, *Brassica campestris* (L.), Root/shoot length

---

INTRODUCTION

Plant physiology can be said as the study of vital phenomena in plants. It is concerned with the processes and functions, and responses of plants to their surroundings. The results if plants responses to the environment namely growth and reproduction are also studied in plant physiology. The study of plant physiology is necessary not only from the theoretical standpoint but it also helps us to understand the basic functioning of the plant. Knowledge of plant physiology is also applied for human welfare, Agriculture, horticulture forestry, floriculture, plant breeding, plant pathology, pharmacology are some of the applied fields of science. As world population increases, mankind faces enormously complex problems. Their solutions will require input from many sources: social, economic, technological and agricultural. One of the primary tasks of the future will be to increase food, forage, fiber and wood production substantially throughout the world. Future agricultural research programs will continue, as in the present, to have as their major goals the production of new and better varieties and strains of crop plants, the improvement of plant protection against insects, diseases and weeds, the control of soil fertility and an increase in mechanization efficiency. However, in addition, there will be a sharp intensification of demands of plant physiologists not only to supply basic information regarding how plants grow and develop but also to undertake research programs designed specifically to increase yields of plant products.

One of the important contributions of the nineteenth century experimental plant physiology to agriculture was the discovery that soil fertility and crop yields could be increased by adding several nutrients to the soil. Prior to the nineteenth century, the common method for increasing crop production was to apply plant and animal debris (manures, composts etc.) to soil. It was not realized that this treatment returned to the soil only a portion of nutrients

that had been extracted by plants. Another centuries old agricultural practice was to rotate crops periodically with other crops. This practice resulted in increased growth of crops. Only in the early 1800s, agricultural scientists realize that crop plants grow in proportion to the amounts of various nutrients present in soils. Nineteenth-century agronomists adopted this principle. Today the application of various salts to soils is a basic feature of agricultural practice. Without the application of these throughout the world during and other fertilizers to soils, the large crop yields obtained in developing countries, the past 50 years or more could not be possible. In modern agricultural practice, various chemicals in solution or aqueous suspension are sprayed onto the crop plants within the object of accelerating and modifying the plant growth and development.

MATERIALS AND METHODS

Selected thiosemicarbazides are
M3] 1-γ-picolinoyl-4-m-tolyl thosemicarbazides
M4] 1-γ-picolinoyl-4-0-chloro phenyl thosemicarbazides
M5] 1-γ-picolinoyl-4-0-tolyl thosemicarbazides

The solutions of M3, M4 and M5 of the concentration 0.0001 mol.Kg^{-1} was prepared using 70 % DMF-water solvent.

Selection of System
In general practice, various chemicals are used in agricultural as an important ingredient of various pesticides, insecticides, fertilizers etc. to improve the crop yield. Amongst several economically important plants, *Brassica campestris* (L.) were selected as a plant system. *Brassica campestris* (L.) is an ideal system to study the germination and growth pattern, commonly known as mustard and used as an important ingredient in spices. Further, its economical importance is reflected by its wide use for the extraction of fatty acids. It is also used in lamps, in oiling wooden goods, in the manufacture of soap, rubber substitute and for quenching or tempering steel plates. The refined oil generally referred to as Colza oil is also edible and used as a lubricant for delicate machinery. Such a widespread use of *Brassica campestris* (L.) in daily life is persuasive to study its response against different solutes, regarding to physiological processes; particularly germination is a vital process for the growth of plants.

For Germination tests, healthy seeds of *B. campestris* (L.) of same generation were taken and thoroughly washed using doubly distilled water. The germination trays sterilized with 0.01% of $HgCl_2$ for 2 minutes and were prepared by keeping 100 seeds in folded blotting paper for each treatment.

The test solutions of 0.0001 mol.Kg^{-1} were added. A controlled set was similarly run using distilled water. The percent germination was recorded daily up to ten days. The protrusion of radicle through seed coat was tsaken as the criteria of seed germination. The speed of germination index (SGI) was calculated by H. Li, *et al* [1-2] –

SGI = (10g + 9g + 8g +7g + 6g + 5g + 4g + 3g + 2g)

Where; g represents number of germinated seeds after 24 hours. For the study of growth and chlorophyll content, the same conditions were kept and estimation of total chlorophyll, chlorophyll-a, chlorophyll-b were made according to Jahagirdar [3] and expressed in mg/Lit.

Chlorophyll (total) (gm/lit) = $0.0202(O.D.)_{645} + 0.00802 (O.D.)_{663}$
Chlorophyll-a (gm/lit) = $0.0127(O.D.)_{663} - 0.00269 (O.D.)_{645}$
Chlorophyll-b (gm/lit) = $0.0229(O.D.)_{645} - 0.00488 (O.D.)_{480}$

On the same day, root length, shoot length and fresh weight of seedlings were measured. The dry weight was measured by keeping 25 fresh plantlets in oven first at 70°C and later at 100°C to obtain a constant weight as observed by Abdul-Baki and Anderson, J. D [4]. Vigor index was determined according to A. K. Bera & K. Bokaria [5] as –

Vigor index = percent germination [(root length+shoot length)mm]

EXPERIMENTAL AND COMPUTED DATA

Table 1: Chlorophyll and Dry Matter Content for Control and Treated Plants.

Systems	Chlorophyll-total (mg/lit)	Chlorophyll-a (mg/lit)	Chlorophyll-b (mg/lit)	Dry matter
Water	5.5545	4.0102	2.7868	8.81
M3	7.3611	4.5131	3.961	8.94
M4	3.5060	2.4656	1.7257	6.80
M5	5.3220	3.435	2.726	8.75

Table 2 : Percent Germination, Speed of Germination Index and Vigor Index for Control and Treated Plants.

Systems	Percent Germination	Percent Reduction over Control	SGI	Percent Reduction over Control	Vigor Index	Percent Reduction over Control
Water	100	--	728	--	1340.0	--
M3	99	98	927	321.3	1544.4	432.5
M4	100	100	911	314.0	1390.0	379.3
M5	100	100	884	301.8	1730.0	496.5

Table 3: Root Length, Shoot Length and Root/Shoot for Control and Treated Plants.

Systems	Root length	Percent Reduction over Control	Shoot length	Percent Reduction over Control	Root/Shoot	Percent Reduction over Control
Water	7.6	--	5.8	--	0.9688	--
M3	9.8	326.0	5.8	65.7	1.3750	113.6
M4	7.8	239.1	6.1	74.2	1.2220	89.8
M5	11.0	378.2	6.3	80.0	1.1110	72.6

RESULTS AND DISCUSSION

Early attempts have been made by S. Adhikari *et al*[6] to study the effect of tannery effluent on seed germination, seedling growth and chloroplast pigment content in mungbean. M. D. Patil *et al*[7] have observed the effect of raw sewage water on mustard. In the present investigation, effect of different solutes on the chlorophyll, dry matter, percent germination, SGI, vigor index, root length, shoot length, root shoot ratio of *B. campestris* (L.) have been studied.

The photosynthetic pigments were found affected in *B. campestris* (L.) by the treatments. It can be seen from Table−I that chlorophyll content is found to be increased in all solutes. D. M. Rhoads & L. McIntosh [8] also reported the increase in chlorophyll with respective drought mitigation practices. A. Chandra & R. K. Bhatt [9] observed the marked increases in chlorophyll content and anthocyanins in salicylic acid treated *Spirodela* plants. S. U. Siddiqui *et al.*[10] observed that salicylic acid treatment increases or decreases chlorophyll content, depending on the genotype, of cowpea (*Vigna unguiculata*).

The chlorophyll a and b also exhibited the same trend.

It can be seen from Table−I that the dry matter content decreases over water..

Percent Germination:

The development of majestic oak tree from a small acorn requires a precise and highly ordered succession of events. Starting from a single fertilized egg, plant cells divide, grow and differentiate into increasingly complex tissues and organs. These events along with their underlying biochemistry and many factors that either impose or modulate on unfailing an orderly progression through the life cycle constitute development, i.e., seed germination. If any cycle can be said to have a beginning in plants, the beginning would be germination of seed. The seed is a convenient place to begin because seeds are quiescent or resting organs that represent a normal hiatus in life cycle. When the conditions are appropriate, the seed will renew its growth and germinate. Such an important phenomenon will be affected by different conditions, observed N. Jabeen & M. Ahmed [11].

It is clear from Table−II that in all cases, the percent germination in all the treatments increases than that of control.

Speed of Germination Index (SGI):
The response of seeds to hydration varies. This variation is in the initiation of germination or emergence. The seeds may start emerging on the first day or it requires some period for necessary adaptation. This time requirement can be studied by determining the speed of germination based on the day of starting the germination multiplied by suitable factors.

As in the percent germination, the treatments showed increase over control. The speed of germination index was increased surprisingly . The similar observations on different plants were made by P. Malviya, A. Sharma & R. Jain also[12-13].

Vigour Index:
The seed quality is having the synonymous terms seed vigour in literature. On the basis of seed vigour, one can predict about the seed germination and yield of grain. The seed vigour may be improved by using fertilizers, irrigation, pest control and soil management. Whatever chemicals are used to improve the seed vigour contain different groups which can negatively affect the basic purpose of that chemical. As reported by earlier workers L. Jing *et al*[14], in the present investigation also, it has been observed from Table−II that, vigour index of treated seeds was effectively increased over control.

Root Length, Shoot Length and Root-Shoot Ratio:
Germination starts when the seed shows emergence phase of growth, which begins with penetration of embryo from the seed coat and ends with the development of root and shoot system. The rate and extent of elongation is subjected to a variety of controls including nutrition, harmones and environmental factors, observed P. Zhao *et al* and Asha Raghav [15-16].

Though the root and shoot developments start within a fraction of time but the further developments may vary according to the nutrients required for the development of root and shoot independently. Therefore, root and shoot lengths differ. Table−III clearly indicates that, root length and shoot length show tremendous increase over control.

The changes in the growth pattern of root and shoot was studied by the proportionate growth in both. The root-shoot ratio reflects the same and represents the development in root and shoots simultaneously. The solutes show positive effects .

REFERENCES

[1] H. Li, J. Kim, L. Groy, *J. Am. Chem. Soc*., **2001**, 123, 4867
[2] M. Ashraf, N. Akhtar, F. Tahira & F. Nasim, *Pak. J. Biol. Sci*., **1999,** 2 (4) 1594 -1597
[3] P. L. Bruckner & R. C. Frohberg, *Int. J. Agric. Bio*., **2002,** 2, 300-302
[4] D. V. Jahagirdar; Experiment in Chemistry, 1st Ed., Himalaya Publishing House, **1994**
[5] S. M. Basara, N. Ahmad, K. Rehman & N. Iqbal, *Int. J. Agric. Biol*., **2002**, 4, 127 -130
[6] A. A. Abdul-Baki & J. D. Anderson, *Crop Sci.*, **1973**, 13, 630-633
[7] A. K. Bera & K. Bokaria, Environ. *Ecol.*, **1999**, 17 (4), 958-961
[8] S. Adhikari, A. Mitra & S. K. Gupta, *J. Instr. Publ. Health. Engrs, India*,**1998**, 2, 5
[9] M. D. Patil, D. P. Biradar, V. C. Patil & B. S. Janagoudar, Am. *Eurasian J. Agric. & Environ. Sci*.,**2011**, 11 (3), 360-364
[10] D. M. Rhoads & L. McIntosh, *Proc. Natl. Acad. Sci*., **1991**,USA, 80-88, 2122
[11] A. Chandra & R. K. Bhatt, *Photosynthetica*,**1998**, B 35, 255-258
[12] S. U. Siddiqui, A. Aliand & F. Chaudhary, *Pak. J. Bot.*, **2008**, 40 (3), 1121-1127
[13] N. Jabeen & M. Ahmed, *Pak. J. Bot*., **2009**, 41 (4), 1677-1683
[14] P. Malviya & A. Sharma, *J. Environ. Bio*., **2011**, 32 (1), 5683-91
[15] R. Jain, S. Solomon, A. K. Shrivastava & A. Chandra, *Acta. Physiol. Plant*., **2011**, 33 (30), 905-910
[16] L. Jing, L. Shi-Qing, L. Yi & C. Xiao-Li, *Plant Soil Environ*., **2009**, 255 (7), 273-280
[17] P. Zhao, G. C. Sun, X. P. Zeng, X. A. Cai & S. L. Peng, *Acta. Ecologica. Sinica*., **2003**, 23, 1386-1394