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Effect of UV radiation on seeds physiological parameter: A review

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Abstract
Number of seed treatments methods are available now days for improving germination and increasing vigor of seedling. Seed invigoration means treating seed before sowing and before storage to get healthy seedlings under favorable and unfavorable condition. There are many types of seed invigoration for seeds but some are rarely used by farmer group to treat the seeds. Physical seed invigoration is recent advances in seed technology for seed treatment Use of radiations for treating plants is adapted from many past years but only few studies reported in seed technology. UV radiations are responsible for causing mutations in living organism present on earth. It was found that the seeds exposed to the UV radiations for longer duration showed marked effect on the germination percent and the probable reason found for the behavior was due to breaking of seed coat, increase in internal temperature of seed. On the part of health seeds behaved in more potent way in tackling the diseases. Probable reason for such kind of behavior may be the mutation in genome of the individual plant seed.

Keywords: germination, seed vigour, phytotoxic, UV radiation, mutation

Introduction
Seed germination and vigour is important parameter in seed technology and for this researcher and farmers always trying to provide good seed treatment and invigoration before sowing and after sowing. But adverse effect of given seed treatment never been estimated during higher production and productivity. Sustainability in agriculture is one of the major tasks in front of humanity to maintain ecology and keeping resources as it in same condition for future generation (Edmondson *et al*., 2014) [5]. Use of technology and advance methods to reduce use of chemicals and safety of environment for sustainable agriculture is main target of every nation (Pretty *et al*., 2006) [14].

In modern era of agriculture people are using large amount of chemicals and toxic substance to get more yield without thinking the ecology and sustainability. Use of cultural and physical methods might shows better effect to get more good result in agriculture (Aladjadjiyan, 2012) [1]. Physical method of seed treatment shows better result over old methods of seed treatments by using toxic chemicals which are not only dangerous for human but also ecosystem. Application of physical seed invigoration treatments maintains soil and environment without harming microbial population present in soil.

Some researchers reported that the adverse effect of UV radiations on seed physiological parameters along with beneficial effect on seeds. Changes in duration of treatments and concentration shows the variation in result of germination and vigor.

The present review paper with short explanation helps to explain the effect of UV radiation on germination and vigor of seeds in different crops.

Effect of UV radiation treatment on Seed viability and vigour
On Seed Germination
Gandhi *et al.,* (2019) [6] reported that Germination per cent and chlorophyll concentration adversely affected by UV radiation with 253 nm in horse gram (Macrotyloma uniflorum L.). Increase in UV radiation lower down the chlorophyll a and b both. Lower exposure period of UV radiation shows positive effect on seed germination of Bengal gram 13 to 17-minute exposure of UV radiation shown good germination. Peykarestan and Seify (2012) [13] concluded that as UV radiation increased germination of red bean seeds were decreased it means UV radiation doses are inversely proportional to seed germination. Rupiasih and Vidyasagar (2014) [15] concluded that wheat seed exposed to UV-C radiation showed enhanced germination. Torres *et al*., (1991) [18, 19] reported that when sunflower seeds exposed to UV-C radiation from 5 to 60 minutes showed higher number of normal seedlings after treatment.

Neelamegam and Sutha (2015) [12] concluded that increased germination and seedling vigour reported after 60 min irradiation treatment with UV-C in groundnut plants. Erram *et al.,* 2017. Revealed that less germination was re

Some researcher reported negative effect of UV radiation on seed treatment. Wang *et al.,* 2018 [20] reported negative effect of UV light seed treatment he revealed that UV-B radiation reduce the nutrient metabolism and seed germinability after treatment. Lizana *et al.* (2009) [11] and Shinklea *et al.* (2004) [16] reported that application f short wave length of UV-B radiation inhabit the growth of hypocotyl and also reduce the elongation in cucumber seeds. Wang *et al.,* (2018) [20] also concluded that increased permeability, loss of membrane integrity and water release from intercellular space is the effect of UV-B radiation which affect the smaller cell volume and irregular shape of cell.

In an experiment conducted by Pouria *et al*., backs with six replications of 30 seeds per replication in laboratory conditions. The seeds are treated with UV-C radiation for different durations such as 0 min (control), 30 min, 2 hours, 4 hours, 8 hours and 12 hours. The wavelength of UV-C radiation was 254nm and intensity was 54mJ cm-2. After the treatment germination tests have been conducted with completely randomized design (CRD) at room temperature (24℃) in darkness. The evaluated variables for assesing the effect of UV-C radiation included germination rate, radicle length and plumule length.

On seed vigor

Seed vigor refers to ability of healthy seeds to give strong seedling which can establish all the plant part under favorable condition. Thousands of scientists worked on effect of UV radiation on different growth and reproductive system of plant (Kovács and Keresztes, 2002; Heisler *et al*., 2003) [9, 8]. Less number of studies conducted to seed to conclude the effect of UV radiation treatment on seed vigor and planting value. Gandhi *et al.,* (2019) [6] reported that shoot and root length in Bengal gram were adversely affected by seed exposure to UV radiation due to formation of toxic substance inside the seed. Siddiqui *et al*., (2011) [17] reported that shoot weight, length of shoot, length of root, weight of root and area of leaf enhanced after exposing groundnut seeds to UV-C radiation for 10,15, 30 and 60 minutes of time. Brown *et al*., 2001 [1] revealed that treatment of UV-C radiation on cabbage seeds and grown under greenhouse condition found better improvement in growth parameters. Lingakumar and Kulandaivelu, 1998 [10] concluded that application of UV radiation in Cymposis seedlings shows vigorous growth. Hamid and Jawaid 2011 [7] reported that Application of UV radiation to planting material enhance the synthesis of Indol Acetic Acid (IAA) which give rise healthy and strong seedling.

Sometime increased concentration of UV radiation and duration of treatment affect the integrity of seed coat and leach out the internal material during storage and it results loss in vigor and viability on field condition after sowing the seeds. Choudhary and Agrawal, 2014 [4] concluded that physiology of seed sometime gets disturbing due to excessive use of UV radiation to seeds i.e. It's creates limits on photosynthesis and plant growth by injury to protein and membrane and damaging DNA.

Conclusion

Application of physical seed treatment not only give good seedling with good vigour but also it not leave any deleterious effect in soil and nature if you compare with chemical seed treatment. Use of UV radiation with proper concentration and duration shows good result for vigor and viability of seeds.

References

1. Aladjadjiyan A. Physical factors for plant growth stimulation improve food quality," in Food Production - Approaches, Challenges and Tasks, ed. A. Aladjadjiyan (Rijeka: InTech) 2012, 145-168.
2. Brown JE, Lu TY, Stevens C, Khan VA, Lu JY, Wilson CL, *et al*. The effect of low dose ultraviolet light-C seed treatment on induced resistance in cabbage to black rot (Xanthomonas campestris pv. campestris). Crop Prot 2001;20:873–883.
3. Caldwell MM, Flint SD. Stratospheric ozone reduction, solar UV-B radiation and terrestrial ecosystems. Climatic Change 1994;28:375-394.
4. Choudhary KK, Agrawal SB. Ultraviolet-B induced changes in morphological, physiological and biochemical parameters of two cultivars of pea (*Pisum sativum* L.). Ecotoxicol. Environ. Saf 2014;100:178-187.
5. Edmondson JL, Davies ZG, Gaston KJ, Leake JR. Urban cultivation in allotments maintains soil qualities adversely affected by conventional agriculture. J Appl. Ecol 2014;51:880-889.
6. Gandhi N, Rahul K, Chandana N, Madhuri B, Mahesh D. Impact of ultraviolet radiation on seed germination, growth and physiological response of Bengal gram (*Cicer arietinum* L.) and Horse gram (*Macrotyloma uniflorum* L.) J Biochem Res 2019;2(1):019-0034.
7. Hamid N, Jawaid F. Influence of Seed pre-treatment by UV-A and UV-C radiation on germination and growth of Mung beans. Pak. J Chem 2011;1(4):164-167.
8. Heisler GM, Grant RH, Gao W, Slusser JR. Ultraviolet radiation and its impacts on agriculture and forests. Agric. For. Meteorol 2003;120:3-7.
9. Kovács E, Keresztes Á. Effect of gamma and UV-B/C radiation on plant cells. Micron 2002;33:199-210.
10. Lingakumar K, Kulandaivelu G. Differential responses of growth and photosynthesis in *Cymopsis tetragonoloba* L. grown under ultraviolet-B and supplemented longwave length radiation. Photosynthetica 1998;35:335-343.
11. Lizana XC, Hess S, Calderini DF. Crop phenology modifies wheat responses to increased UV-B radiation. Agric. For. Meteorol 2009;149:1964-1974.
12. Neelamegam R, Sutha T. UV-C Irradiation Effect on Seed Germination, Seedling Growth and Productivity of Groundnut (*Arachis hypogaea* L.). Int. J. Curr. Microbiol. App. Sci 2015;4(8):430-443.
13. Peykarestan B, Seify MR. UV irradiation effects on seed germination and growth, protein content, peroxidase and protease activity in red bean. Int. J. Appl. Basic. Sci 2012;1(3):107-113.
14. Pretty JN, Noble AD, Bossio D, Dixon J, Hine RE, Penning De Vries FWT. Resource-conserving agriculture increases yields in developing countries. Environ. Sci. Technol 2006;40:1114-1119.
15. Rupiasih NN, Vidyasagar PB. Effect of UV-C radiation and hyper gravity on germination, growth and content of chlorophyll of wheat seedlings. The 4th International Conference on Theoretical and Applied Physics (ICTAP) 2014.
16. Shinkle JR, Atkins AK, Humphrey EE, Rodgers CW, Wheeler SL, Barnes PW, *et al*. Growth and morphological responses to different UV wave bands in

cucumber (*Cucumis sativum*) and other dicotyledonous seedlings. Physiol. Plant 2004;120:240-248.
17. Siddiqui A, Dawar S, Zaki MJ, Hamid N. Role of ultraviolet (UV-C) radiation in the control of root infecting fungi on groundnut and mungbean. Pak. J Bot 2011;43(4):2221-2224.
18. Torres MFG, Duran JM. Sunflower seed deterioration from exposure to UV-C radiation. Environ. Exp. Bot 1991;31(2):201-207.
19. Torres M, Frutos G, Duran JM. Sunflower seed deterioration from exposure to UV-C radiation. Environ. Exp. Bot 1991;31(2):201-207.
20. Wang Ma M, Yang PR, Gu Z. Effects of of UV-B radiation on the isoflavone accumulation and physiological-biochemical changes of soybean during germination: Physiological-biochemical change of germinated soybean induced by UV-B. Food Chem 2018;250:259-267.