Journal of Science and Humanity

[Vol. 1 No. 1]

EFFECT OF GROWTH REGULATORS ON BETACYANIN IN MEDICINAL PLANT *SIMAROUBA GLAUCA* DC

EFFECT OF GROWTH REGULATORS ON BETACYANIN IN MEDICINAL PLANT *SIMAROUBA GLAUCA* DC

*Patil Manasi.S. and Gaikwad D. K.

*Department of Botany & plant Protection, Sadguru Gadage Maharaj College, Karad.

Department of Botany, Shivaji University, Kolhapur. 416004 (MS) India

e-mail: ; dkgaikwad88@gmail.com

Abstract:

An experiment was conducted to study effect of foliar application of growth regulators on Betacyanin in *Simarouba glauca*. The result indicated that due to the Foliar Applications of various PGRs (6-BA, GA, SA, CCC,cysteine and methionine) the betacyanin content was significantly decreased in response to GA, 5 ppm CCC, 5 ppm 6- BA, cysteine, SA. On the other hand it was increased in response to 20 ppm 6- BA, 20 ppm CCC and methionine in rachis of *S. glauca.* In leaf tissue it was decreased in response to 6-BA, GA, CCC, 20 ppm cysteine, 5 ppm SA and 5 ppm methionine foliar sprays and increased due to 5 ppm cysteine, 20 ppm SA and 20 ppm methionine. Thus the alteration in betacyanin content due to these growth regulators might be acted through alteration in amino acid metabolism of *S. glauca.*

Keywords: *Simarouba glauca*, Betacyanin, 6-BA, GA, SA, CCC, Cysteine and Methionine

Introduction:

Betacyanin is a group of red pigments found to occur in higher plants which is separated from yellow-indole-derivatives of betalain. These pigments are nitrogen containing glycosylated compounds and are chemically distinct from anthocyanins. Betalains are further classified as betaxanthin which show a group of yellow pigments whereas betacyanins are strictly red or pink colored plant pigments. However in orders like caryophyllales, chenopodiales and families like cactaceae, amranthaceae, portulacaceae, nyctaginaceae, crusiferae shows presence of betacyanins in eighter stem, androecium, leaf and inflorescence. In some plants of family amranthaceae and caryophyllaceae betacyanins replaces anthocyanins[1]. Betacyanins are induced due to the signals of light, wounding and development. However, it has similar physiological role to that of anthocyanins [2].

It is one of the important components of additives in food products, medicines, cosmetics etc. due to their natural colorant properties and less toxicity[3]. It also shows positive effect on health of human being as these are having natural antioxidant properties[4]. In *Amaranthus* it is well known as Hopi Red Dye which contains red dye which is utilized by Hopi Amerindians as a source of dye from flowers. Betanin, a member of betacyanin pigments subfamily, is a powerful antioxidant anticancer compound [5].

Simarouba is a rainfed, wasteland, medicinally important edible oil tree belongs to family Simaroubaceae.It is commonly known as Laxmitaru. *Simarouba* is recognized as a high value medicinal plant. The bark is one of the important constituent of herbal drug. The bark and leaf extract is well known for its different types of pharmacological properties

Materials and Methods:

The fully developed seedlings of *S. glauca* were planted in field plots of 2mX 2m size in the month of July. The seedlings were allowed to establish in field for three months. The plots were equally irrigated with tap water. After establishment of seedlings each plots were sprayed with respective 5 and 20 ppm concentration of growth regulators during month of October 2010. Foliar sprays were given in duplicate after every 7 days for four weeks. The influence of foliar application of 5 and 20 ppm PGRs like 6-BA, GA, SA, CCC, Cysteine and Methionine on Betacyanin content of *S. glauca* was studied

Betacyanin was estimated following the method described by [6]. 0.5g freshly harvested leaf and rachis discs were placed in 10 ml of 1 % aq. HCl for 48 hrs at 4^0C in darkness for the extraction of betacyanin pigment. Then absorbance of the extract was measured at 525 nm. The values were corrected for dispersion by measuring the optical density at 660 nm.

Result and Discussion:

The effect of plant growth regulators on betacyanin content of *S. glauca* rachis and leaf tissue is shown in fig.1. It is evident from the figure that the betacyanin content is significantly decreased

in response to GA, 5 ppm CCC, 5 ppm 6- BA, cysteine, SA. On the other hand it is increased in response to 20 ppm 6- BA, 20 ppm CCC and methionine in rachis of *S. glauca.* In leaf tissue it is decreased in response to 6-BA, GA, CCC, 20 ppm cysteine, 5 ppm SA and 5 ppm methionine foliar sprays. While in response to 5 ppm cysteine, 20 ppm SA and 20 ppm methionine it shows increasing trend.

Inhibition of betacyanin by GA in *Celosia* seedlings[7]. Kinetin and tomatin increases betacyanin efflux from discs of beet root tissue whereas gibberellic acid and ethrel decreases the efflux [8]. Interactions of Abscisic acid, cytokinin and gibberellins in the regulation of betacyanin synthesis in seedlings of *Amaranthus caudatus* was studied by [9]. They observed that in derooted seedlings of *A. caudatus* L. betacyanin synthesis induced by white light or cytokinin and it was inhibited by ABA or mixture of gibberellins A_4 and A_7 ($GA_{4/7}$). According to [10], an excised oat root absorbed salicylic acid and elevates ion activity and promotes betacyanin efflux passively. Under acidic condition pigment concentration have been increased [11] due to salicylic acid response in beet root. Betacyanin content was positively correlated with 6 BA concentrations in the range of 0.1-2.0 mg/l. In *Chenopodium album* an increase in betacyanin accumulation by cytokinin was repoted by [12]. Similar results are reported by [13,14] in *Saussurea medusa* and *Alternanthera brasiliana* respectively. Application of cytokinin decreases betacyanin accumulation in cell suspension cultures of *Portulaca* [15] and *Mammillaria candida* [16]. Efflux of betacyanin from slices of beet root was also enhanced by treatment with CCC [17]. GA inhibited betacyanin synthesis in *A. Caudatus* seedlings due to decrease in total free amino acids and particularly tyrosine[18]. GA inhibited the light induced amaranthin synthesis in *A. tricolar* seedlings[19,20]. Exogenous GA inhibited phytochrome mediated betacyanin synthesis in *A. caudatus* seedlings [21].

In the present study we noticed a decrease level of in betacyanin content due to gibberellic acid and most of the growth regulators while GA inhibited betacyanin synthesis is related to depletion of amino acids as reported by [22] and its increased levels in response to CCC are attributed to the increasing levels of total free amino acids [23]. Thus the alteration in betacyanin content due to these growth regulators might be acted through alteration in amino acid metabolism

of *S. glauca.* But the amount of betacyanin content is very low because this plant also exhibits presence of anthocyanin pigments in appreciable quantities.

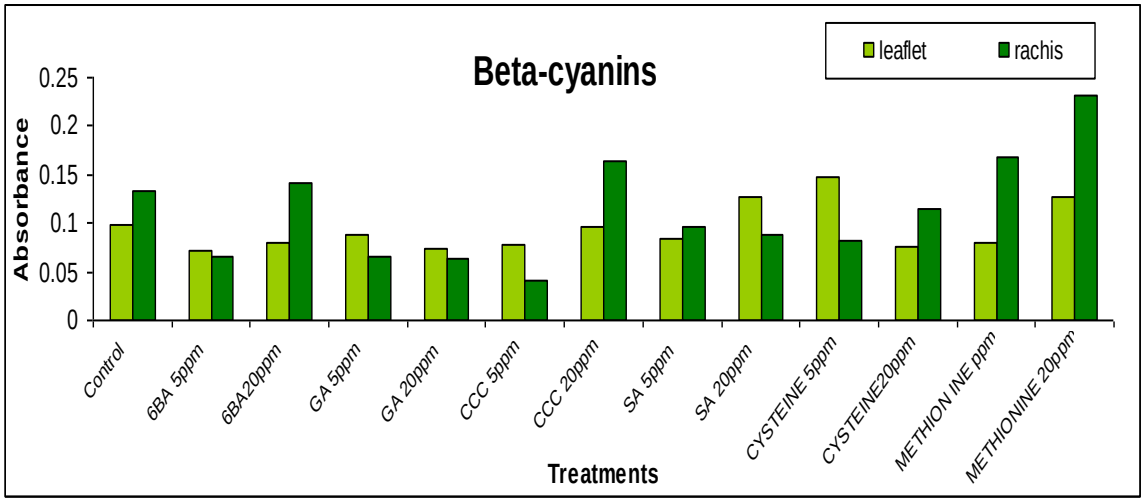

Fig. 84 Effect of foliar spray of PGRs on the content of betacyanin in the leaves of *S. glauca*

References:

1. Mabry, T. J., T. Swain. Academic press London and New York, (1966).
2. Piatelli, M.: *The Biochemistry of Plants*, Vol 7 . Conn, E.E. (ed.)(Publ.) Academic, Press, New York, pp:557-575, (1981).
3. Pedreňo, M. A. and Escribano, J. : *J Sci Food Agric*., **81**: 627–631, (2001).
4. Tesoriere, L.; Allegra, M.; Butera, D. and. Livrea, M. A.: *American Journal of Clinical Nutrition* **80** (4): 941–945, (2004).
5. Lee, C. H.; Wettasinghe, M.; Bolling, B. W.; Ji, L. L. and Par-kin, K. L. *Nutr Cancer.*, **53** :91-103, (2005).
6. Wagner, E. C.: *Canadian J. Bot*, **48**(1): 1-18, (1970).
7. Srivastava, H. V. and Laloraya, M. M. : *Nuture New Biology*. **243**:224, (1993).
8. Naik, B. I.; Sharma, V. and Srivastava, S. K. :*Phytochem*.**19**:1321-1322. (1980).
9. Biddington, N. L. and Thomas, T. H.: *Physiologia Plantarum*, **40**(4):312–314, (1980).
10. Harper, J. R. and Balke, N. E.: *Elsevier*, Amsterdam, pp. 399-400, (1981).
11. Siegel S. M.: *Physiol Plant*. **23**: 251-257, (1970).
12. Rudat, A. and Göring, H.. *J Exp Bot*., **46**: 129–134, (1995).

13. Zhao, D.; Wang, Y. and Zhao, J. *Chin J Biotechnol*., **14**: 141–147, (1998).
14. Silva, N. C. B.; Macedo, A. F.; Lage, C. L. S.; Esquibel, M. A. and Sato, A. *Braz Arch Biol Technol.*, **48**: 779–786, (2005).
15. Noda, N. and Adachi, T. : *Plant Biotechnol*., **17**: 27–34, (2000).
16. Santos-Diaz, M. S.; Velasquez-Garcia, Y. and Gonzalez-Chavez, M. M..*Agrociencia*, **39**: 619–626. (2005).
17. Fabijan, D. M.; Dhindsa, P. P. and Reid, D. M. : *Planta*, **152**(6):481-486,(1981).
18. Sweet, S. S. and Guruprasad, K. N.: *Indian J Exp Biol.*, **31**: 168-172, (1993).
19. Stobart, A. K.; Pinfield, N. J .and Kinsman, L. T.. *Planta.*, **94**: 152-155, (1970).
20. Colomas, J.; Layton, J. L. and Bulard, C. : *C. R. Acad. Sci*., Ser. D. **277**(2):173-176, (1973).
21. Kinsman, L.T.; Pinfield, N. J. and Stobart, A. K. : *Planta* **127**: 207-213, (1975).
22. Laloraya, M. M.; Srivastav, H. N. and Guruprasad, K. N. *Planta*.,**128**(3):275-276. (1976).
23. Gliszczyn ska-Swiglo, A.; Szymusiak, H. and Malinowska, P. *Food Addit Contam*., **23** :1079–1087, (2006).