International Research Journal of Natural and Applied Sciences
ISSN: (2349-4077)
Impact Factor 7.032 Volume 9, Issue 10, October 2022
Website- www.aarf.asia, Email : editor@aarf.asia , editoraarf@gmail.com

PECTIC ENZYEMES AND EFFECT OF PECTIC ENZYMES ON VARIOUS PECTIC SUBSTANCES

B.P.S.Chauhan and Komalchanchal
Department of Botany, J.S University, Sikohabad

Abstract

The pectic substances are carbohydrates or more exalty carbohydrates derivatives of polyuronide compounds mostly of anhydrogalacturonic acids. The carboxyl groups in pecticpolygalacturonides are either free or parallelly esterified with methyl alcohol or form salts with various cations.

Key Words:*PecticEnzymes, Pectic substances.*

1. Introduction

Pectic substances are distinguished from polysaccharides by the possession of carboxyl groups. These carboxyl groups are part of anhydrogalacturonic acid. Units characteristic of all pectic substances. The carboxyl group of polygalcturonic acids may be party esterified by methyl groups and partly or completely neutralized by one or more bases.

It is believed that galacturonic acid in plants is derived by oxidation of galactose and so the galacturonicacid as well as the peotic substances areregistered as carbohydrate derivatives. According to Kerteen (1939) the simple drain like poly galacturonic acid molecules are aggregated into a complex substances tofrom the pectic substances. The postulated the structure (h)mn for pectin in which (G)m is polygalalacturonic acid and n is units of polygalacturonic acid white to form a secondary aggregate.

The following shows the structure of galacturonic acid and the suggested structure of polygalacturonic acid (Pectic acid).

H OH COOH

Chain of polygalacturonic acid (Pectic acid) without end groups.

The following are the pecticsubstances which have been distinguished byKertesz (1951).

1.Protopectin :Protopectin is the water insoluble parent pectic substances which occur in plants and which, upon restricted hydrotysis, yield pectinic acids.

2.Pectinicacids : The term pectinic acid is used for colloidal polygalacturonic acids, eantaining more than a negligible proportions of mothly ester groups. Pectinic acids, under suitable conditions are capable of ferming gets (jellres) with sugar and acid or if suitably low in mothoxyl content, with contain metallic ions. The results of pectinic acids are either normal or acid pectinates.

3. Pectic : The general term pectin for pectins designates those water soluble pectinitc acids of varying methyl ester content and degree of neutralization. Which are capable of forming gets with sugar and acid under suitable condition.

4.PecticAcid : The term pectic acid is applied to pectic substances mostly composed of colloidal galacturanic acids and essentially free from methyl ester groups. The salts of pectic acid are either normal or acid pectates.

2.Material and Method

There different Indian plant panthogens have been used

Ozoniumtaxanum Neal and wister var. ParasitiumThirumalachar cultures of former two pathogens were obtained from stock cultures of Botany Department, J.S. University, Shikohabad (Firozabad). The strain of 0 taxanumwass an isolate from wilted plants of tomato. The culture of the pathogen was maintained on potato

dextroseqger (20% potato, 2.0% dextrose and 2.0% agar) medium at 250C and were renewed weekly.

In the preliminary experiments a number of synthetic liquid culture media were studied for preparing the active enzmeproparations. In case of 0 texgnum pectin asparagin medium (1% peet5in, 0.2% asparagin, 0.3% potassium dihydrogen phosphate and 0.05% magnesium sulphate) was found to be most suitable for active enzyme preparation.

Only 15ml of each liquid medium was taken in 300ml float bottles, autoclaved at 15 lbs. pressure for 15 minutes and then inoculating with definie amount of inoculums.

In the case of 0 Texanum 20ml liquid culture medium was taken in each bottle and inoculated with 10 pieces of 4mm. diameter cutradially from petridish of 4 days old culture.

After inoculations the bottles were thoroughly spoken to mix the inoculums homogeneously and then were stacked on their flat sides inan incubator at required temperatures. At the end of the required incubation period, the fungal mat was carefully removed the culture bottle, washed with warm distilled water, dried at 700C in an electric oven for 48 houses and then its dry height was determined.

The filtrate was centrifuged at 5000 r.p.m. for 5 minutes and the clear transparent liquid was used as enzyme preparation for assaying various pectic enzymes.

3.EXPERMENTAL RESULTS:

Effect of pectic enzymes on various pectic substances.

The effect of enzyme solutions obtained from 0 texanum on pectin, sodium poly pectate and sodium pectate solution was examined by the various methods mentioned below.

Effect of enzyme preparations from the three pathogens on different pectic substances.

Pectic Substances	% fall in viscosity after 1 minute Ozoniumtexanum	Fast detection of galacturonic acid after hours ozonium+	Amount of galactyronic acid in mg formed * 0+
Pectin	97	½	970.0
Sodium Polypectate	98	½	987.0
Sodium Peotate	17	8	97.0

- Galacturonic acid fromed in12 hourss. Per 1 gm of pectic substance.

3.1 Viscosity Method

It was evident from the results that enzymes of all the there pathogens reduced the viscosity of the pectatesolutionmore rapidly than the pectin solution.

Enzyme from 0 texanum reduced the viscosity of pectin solution by 95% in1 minutes reacted rapidly with both the solution as 97 and 98% full in the viscosity of the pectin and pectate solutions respectively was recorded in one minutes reaction time. The enzyme of 0 texanum was recorded to be most active.

From the above observation it was clear that PG is present inall the three fungi, out weather pectin depolymerase is also present in 0 taxanum is not sure.

3.2 Charmatogzaphic Method

First detectionofgalaoturonic acid was observed in sodium polypectate solution after half an hour by the reaction of the enzyme from all the three pathogens when pectin was used as a substrate, first detection of galacturonic acid was found after half an hour in the case of 0, texanum. When sodium pectate was used as a substract first detection of galacturonic acid was recorded after 8 hours in case 0 texanum.

3.3 Quantitative method

The amount of galacturonic acid formation in the solutions of pectin, sodium polypeotate and sodium pectate was measured after the rection of enzyme preparation. It was observed that greater amount of galacturonic acid was formed in the case of sodium polypectate solution. Enzyme preprations of all the three fungi produced very little galacturonicacidwhen sodium pectate solution was used.

The result obtained by the three methods give the same interference that sodium polypectate is most readily attacked by the pectolytic enzymes secreted by the three pathogens.

4. Discussion

Ozoniumtexanum were formed tobe very adoptive for pectin. Both the pathogens produced more active. Enzymes in the complete absence of any sugar in the medium.

It is now a well established fact that pectolytic enzymes are produced by almost all the facultative parapathogenests of plant diseases. In this connection it has been reported by a number of workers that different pathogens have got different cultural requirements for the production of pectic enzymes (fasta, 1949; Wood 1955, Gupta 1956 and 1960) Gupta and Gupta 1986; Pandey and Gupta, 1966; Kaur and Gupta, 2017). A large number of fungi have been reported tobe adaptive to various pectic substances for the secretion of pectic enzymes (Gaumann and Bohni, 1947 a.b.; Palf 1947; and wood 1960), while others serets these enzymes even in the absence of such pectic substance (Gupta, 1953). In certain cases it has been found that enzyme sereation is restricted of either a pasticularcanpomd or an ion (Wora 1955p and Gupta 1956) but on the other hand a pathogen like Botryliscinerea secretes active enzymes an any cultural meoly on which they can grow without having any special requirements.

Reference.

1. Fostar, J.W. (1949): Chemical activities of fungi, Academic press, Inc. New York.

2. Gupta, S.C. (1956): Studies in the physiology of parasitism. XXII. The production of pectolytic enzymes by pythiumdebareanum HESSE. Ann. Bot., Vol. -20, pp.179-190.

3. Gupta, S.C. (1960): Studies in pectic enzymes of parasitic fungi III. Serection of enzymes by Penicilliumexpansum link.Press. Indian Acad. Sci., Vol. 52B, pp. 103-109.

4. Gupta, M,.N. and S.C. Gupta (1966) : Studies in the pectic enzymes of the parasitc fungi VII. Factors affecting the production of polygaalacturenase and pectic esterase enzymes by Fusariumorthoeeros. App. And WR Vavb.CiceriPadwick. My zopath.Myco. Apple, Vol. 29, pp. 193-200.

5. Wood, R.K.S. (1955):Pectic enzymes secreted by pathogens and their role in plant infection. Mechanisusm of microbial pathogenecity.Sympostum Sec. Gen. Micro boil., Vo. 5, pp. 263-293.

6. Wood, R.K.S. (1960) :Pectic and Cellulalytic enzymes in plant diseases Ann. Rev. Plant. Physisl Vol. II, pp. 299-322.

7. Gupta, S.C. (1953): The production and properties of pectolytic and macerating enzymes secreted by Pythiumdebaranum HESSE. Ph. D. Thesis, Lendon University, England.

8. K. Prathyusha and V. Sunetha (2011) : Bacterial pectinases and their potent biotechnological in fruit processing juice production industries a review. Journal of Phytotogy, Vol. 3, pp. 16-19

9. kertesz, Z.I. (1939) : Pecticewzymes III structured consideration in connection with enzyme hydrolysis of peations J. Annv. Chem. Soc., Vol. 61, pp 2544-2548.

10. Ketesx, .I. (1951). The pectic substances.Intescience Publishers, New York.

11. F. Arnau, D. Yaver, and C.M. Hjort, "Strategies and challenges for the development of industrial enzymes using fungal cell factories, in Grand Challenges inFungal Bio technology, pp. 179-210, Springer, Berlin Germany, 2020.

12. K. Prathyusha and V. Suneetha, (2011): "Bacterial pectinases and their potent biotechnological application in fruit processing juice production industry a review Journal of phytology. Vol. 3, pp. 16-19.

13. P. AlimardaniTheuil, A GainvorsClaisee, and F. Duchiron(2011): Yeasts an attractive source of pectinases from gene expression to potential applications a review Process Bio chemistry vol46 no. 8, pp. 1525-1537.

14. O. J. Oumer (2017):"Pectinase substance, production and their biotechnological applications. International Journal of En. Vironment.Agricultrue and Biotechnology vol2, no.3, Article ID 238761.

15. A. Nawaz, R. Javed, M.Munir M. Hanif and H. Mukhtar (2018): Extraction purification and industrial applications of pectinase. A review Journal of Biotechnology and Bio research Vol. 1p 503-2018.

16. V. Bhardwaj, G. Degrassi, and R.K. Bhardwaj (2017): Microbial pectinases and their applications in industries, a review polymer, Vol. 4(8), pp. 34-45.