REDVET - Revista electrónica de Veterinaria - ISSN 1695-7504
Vol 24, No. 4 (2023)
http://www.veterinaria.org
Article Received: Revised: Accepted:

Exploration Of Antioxidants Effects On The Crude Eps Extraction From Marine Actinomycetes Of Saccharopolyspora

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ABSTRACT:
Periodontitis is a chronic inflammatory disease driven by microbial plaque and an excessive host immune response, leading to tissue destruction and an imbalance between reactive species and antioxidants. While conventional periodontal therapy remains the primary treatment, adjunctive antimicrobial and antioxidant agents may enhance therapeutic outcomes. This study evaluates the antioxidant activity of exopolysaccharide (EPS) crude extract from Saccharopolyspora, a genus of actinomycetes known for its bioactive properties. The antioxidant potential was assessed through Total Antioxidant Activity, DPPH (1,1-diphenyl-2-picrylhydrazyl) scavenging assay, and Total Reducing Property at varying concentrations of the crude extract. The results showed a dose-dependent increase in antioxidant activity, with the highest activity observed at 100% concentration (58% for Total Antioxidant Activity and 48% for both DPPH Activity and Total Reducing Property). These findings suggest that Saccharopolyspora-derived EPS possesses significant antioxidant potential, making it a promising candidate for therapeutic applications in periodontal treatment and beyond. Further research is needed to explore its antimicrobial, anti-inflammatory, and regenerative properties.

INTRODUCTION

Periodontitis has emerged as a silent chronic global burden affecting the quality of life millions of individuals. It is an immunoinflammatory disease that initiates as a response to the microbial dental plaque. The microbes in the dental plaque release an array of noxious substances that instigate a host response resulting in the release of cytokines, chemokines, matrix metalloproteinases that cause destruction of the tooth supporting structures. In addition, the immune cells like polymorphonuclear neutrophils, plasma cells, B cells, T cells are recruited to control the microbial attack. Microbial killing is propogated either through oxygen dependent pathways using NADPH oxidase or oxygen independent pathways using lysosomal phagocytosis. In this process of host-microbial interaction mediated tissue destruction, reactive species are produced. Hydroxyl radical, superoxide dismutase, singlet oxygen, ozone, nitroxyl ion, nitrosonium cation, chloride radicals are some of the examples of reactive species generated, that propagate a chain reaction. This creates an imbalance between the reactive species and inherent antioxidants of the body, which further breeds periodontal disease, leading to deep periodontal pockets, gingival recession, bone loss and mobility.

The progress of periodontal destruction can only be controlled by periodontal therapy. Mechanical therapy in the form of scaling and root planing and periodontal surgery has remained the main stay of treatment. However few perio pathogens like porphyromonas gingivalis ,aggregatibacter actinomycetes comitans and fusobacterium nucleatum have the ability for intraepithelial colonization acting as a node of reinfection. Also, the increased reactive species produced during tissue destruction impair the rate of wound healing and periodontal regeneration. Adjunctive chemotherapeutics with antimicrobial and antioxidant properties would enhance the effectiveness of periodontal therapy with improved treatment outcomes. Local drug delivery in the form of gels, mouthwashes, fibers, chips, lozenges can be used for the same.

Various natural sources of have been explored for their potential antimicrobial and antioxidant properties. Natural herbs like tulasi, neem, ginger, clove, turmeric; food substances such as Green tea, red wine, green pepper, tomatoes, dark chocolates, kale, marine algae and bacterial extracts lactobacilli, bifido bacterium ,streptococcus thermophilus, Diacetilactis, rhodophyceae , chlorophyceae, have been explored as potential antioxidant supplements.

Saccharopolyspora , type of actinomycetes have gained significant attention over the recent years as a potential therapeutic agent . It is a gram positive aerobic actinomycetes that is found at various habitats like soil , marine sediments , plants etc .They have been considered as a potential drug of importance woving to their higher concentration of biomolecules .They produce a wide range of secondary metabolites that are associated with multiple biologic functions such as antimicrobial, antioxidant, anti-inflammatory, anti-cancer properties.

MATERIAL AND METHOD :

The raw materials were collected from the sea and the materials were dried and then formed into powdered form and from it the crude extract was extracted. These crude extract has been used for total antioxidant activity , DPPH activity and reducing power activity to determine the antioxidant effects of actinomycetes of poly saccharospora.

RESULTS:

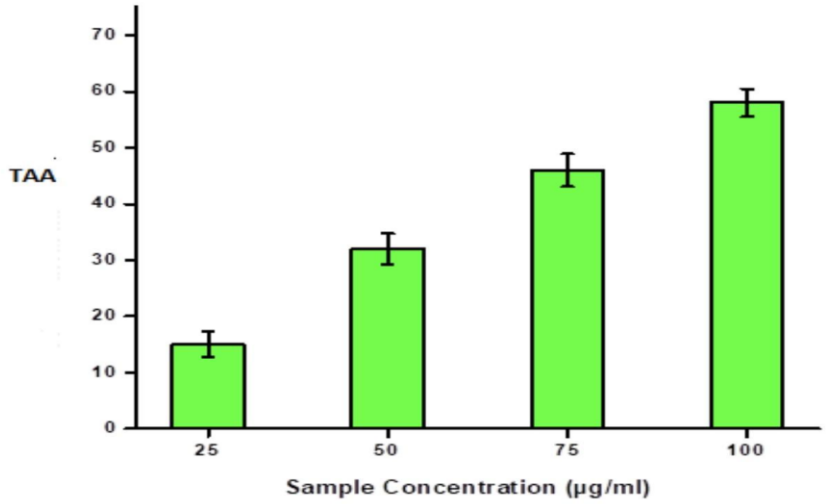

Fig 1: figure 1 depicts the graph bar graph between Total AntiOxidant activity and the sample concentration

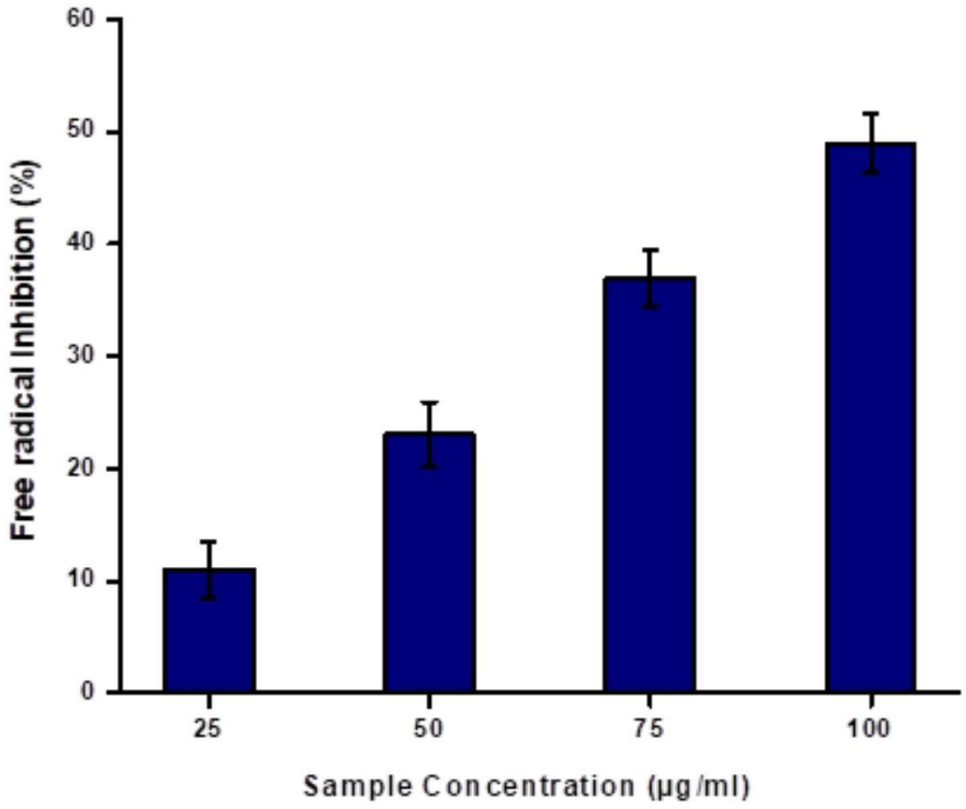

Fig 2 : figure 1 depicts the graph bar graph between DPPH activity and the sample concentration

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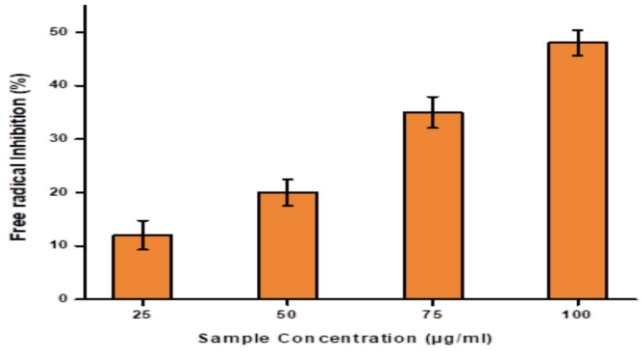

Fig 3 ; figure 1 depicts the graph bar graph between TRP activity and the sample concentration

CONCENTRATION	**TAA**	**ST.ER**
0	0	0
25	15	2.3
50	32	2.7
75	46	2.9
100	58	2.5

TABLE 1: tablet depicts the values of the antioxidants activity of the *sp* at different concentrations of the crude extract of saccharopolyspora

CONCENTRATION	**DPPH**	St.Er
0	0	0
25	11	2.5
50	23	2.9
75	37	2.5
100	49	2.7

TABLE 2:tablet depicts the values of the DPPH activity of the *sp* at different concentrations of the crude extract of saccharopolyspora

CONCENTRATION	TRP	St.Er
0	0	0
25	12	2.7
50	20	2.5
75	35	2.9
100	48	2.4

TABLE 3: tablet depicts the values of the Total Reducing property of the *sp* at different concentrations of the crude extract of saccharopolyspora

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DISCUSSION:
In this study we are going to measure the antioxidant activity by the results obtained from various tests done.Total antioxidant activity tests were done at different concentrations of the crude EPS extract from marine actinomycetes of saccharopolyspora.

Table 1 depicts the values of the antioxidants activity of the *sp* at different concentrations of the crude extract of saccharopolyspora. At 0 concentration the Total antioxidant activity is also measured to be zero and the ST.ER values are also zero. There is a gradual increase in concentration of the extract to see the antioxidant effect of the EPS extract. At 25 percent concentration there is 15% activity of Total antioxidant activity and the ST.ER value is measured to be 2.3. At 50 percent concentration there is 32% activity of Total antioxidant activity and the ST.ER value is measured to be 2.7. At 75 percent concentration there is 46% activity of Total antioxidant activity and the ST.ER value is measured to be 2.9. At 100 percent concentration there is 58% activity of Total antioxidant activity and the ST.ER value is measured to be 2.5.

Similar test with the crude extract was done to measure the activity of DPPH (1,1- diphenyl-2-picrylhydrazyl). The results were analyzed. **Table 2** depicts the the values of the DPPH activity at different concentration of the EPS crude extract. At 0 concentration the DPPH Activity is also measured to be zero and the ST.ER values are also zero. There is a gradual increase in concentration of the extract to see the DPPH Activity of the EPS extract. At 25 percent concentration there is 12% activity of DPPH Activity and the ST.ER value is measured to be 2.7. At 50 percent concentration there is 20% activity of DPPH Activity and the ST.ER value is measured to be 2.5. At 75 percent concentration there is 37% activity of DPPH Activity and the ST.ER value is measured to be 2.9. At 100 percent concentration there is 48% activity of DPPH Activity and the ST.ER value is measured to be 2.4.

Similar test with the crude extract was done to measure the activity of Total reducing property. The results were analyzed. **Table 3** depicts the the values of the Total reducing property at different concentration of the EPS crude extract. At 0 concentration the Total reducing property. is also measured to be zero and the ST.ER values are also zero. There is a gradual increase in concentration of the extract to see the Total reducing property of the EPS extract. At 25 percent concentration there is 12% activity of Total reducing property and the ST.ER value is measured to be 2.7. At 50 percent concentration there is 20% activity of Total reducing property and the ST.ER value is measured to be 2.5 At 75 percent concentration there is 35% activity of Total reducing property and the ST.ER value is measured to be 2.9. At 100 percent concentration there is 48% activity of Total reducing property and the ST.ER value is measured to be 2.4
The antioxidant potential of the EPS crude extract from Saccharopolyspora was evaluated through Total Antioxidant Activity, DPPH Activity, and Total Reducing Property at varying concentrations. The results demonstrated a progressive increase in antioxidant activity with increasing extract concentration. Notably, at 100% concentration, the Total Antioxidant Activity reached 58%, while DPPH Activity and Total Reducing Property recorded 48% each. These findings align with previous studies that have explored the antioxidant potential of microbial exopolysaccharides. Similar research on EPS from Streptomyces species also reported a dose-dependent increase in antioxidant activity, supporting the idea that microbial polysaccharides exhibit potent free radical scavenging and reducing capabilities. The observed trends suggest that Saccharopolyspora-derived EPS possesses significant antioxidant properties, making it a potential candidate for applications in pharmaceutical and food industries.

CONCLUSION:
Within the limitations of this study, we can conclude from all the different types of tests done (Total Antioxidant activity DPPH test, Total Reducing Properties), with crude EPS extract of actinomycetes of saccharopolyspora *sps* we can conclude that the actinomycetes of saccharopolyspora *sps* has antioxidants activity.
Further, research can be done similar to this study on various activity such as anti microbial activity, anti inflammatory activity and many more to explore various effects of marine actinomycetes of saccharopolyspora *sps.*