Production of endoxylanase from novel *Actinomadura geliboluensis* by using agricultural wastes

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CYPRUS 2016

4th International Conference on Sustainable Solid Waste Management

Suitable fermentation medium for endoxylanase production from A. geliboluensis

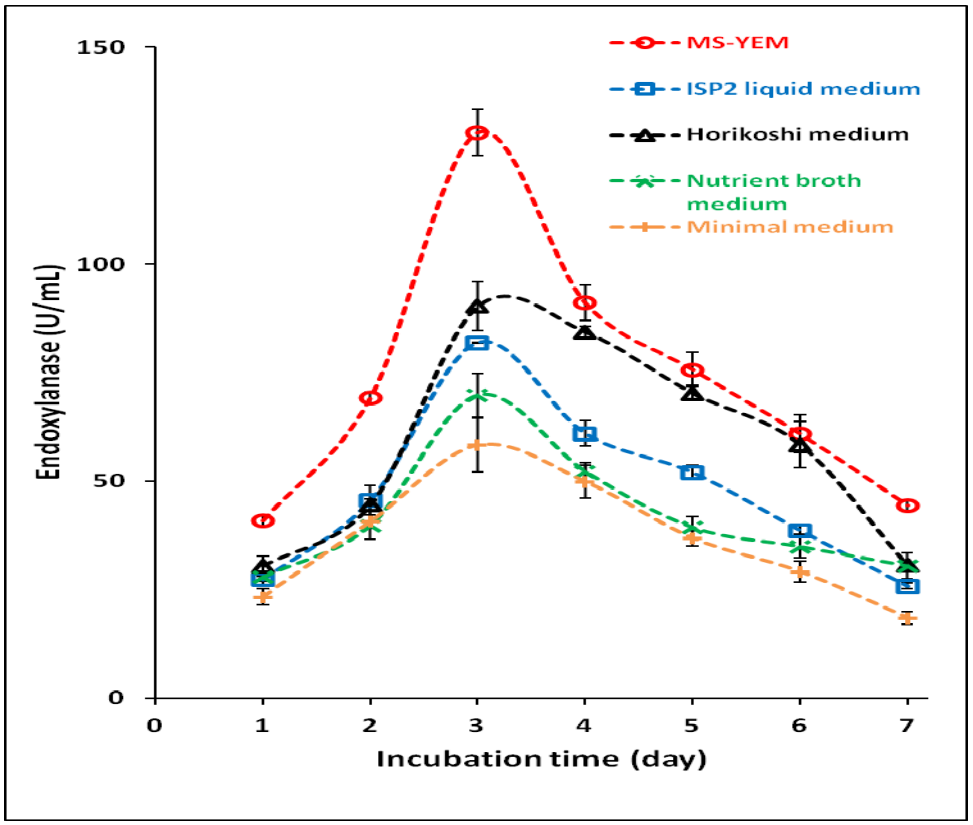

Figure. Time course of endoxylanase production from *A. geliboluensis* in MS-YEM, Horikoshi, ISP2 liquid, Nutrient Broth and Minimal Medium supplemented with 0.5% (w/v) birchwood xylan. Incubation was performed at 30 °C, 200 rpm.

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Suitable carbon sources for endoxylanase production

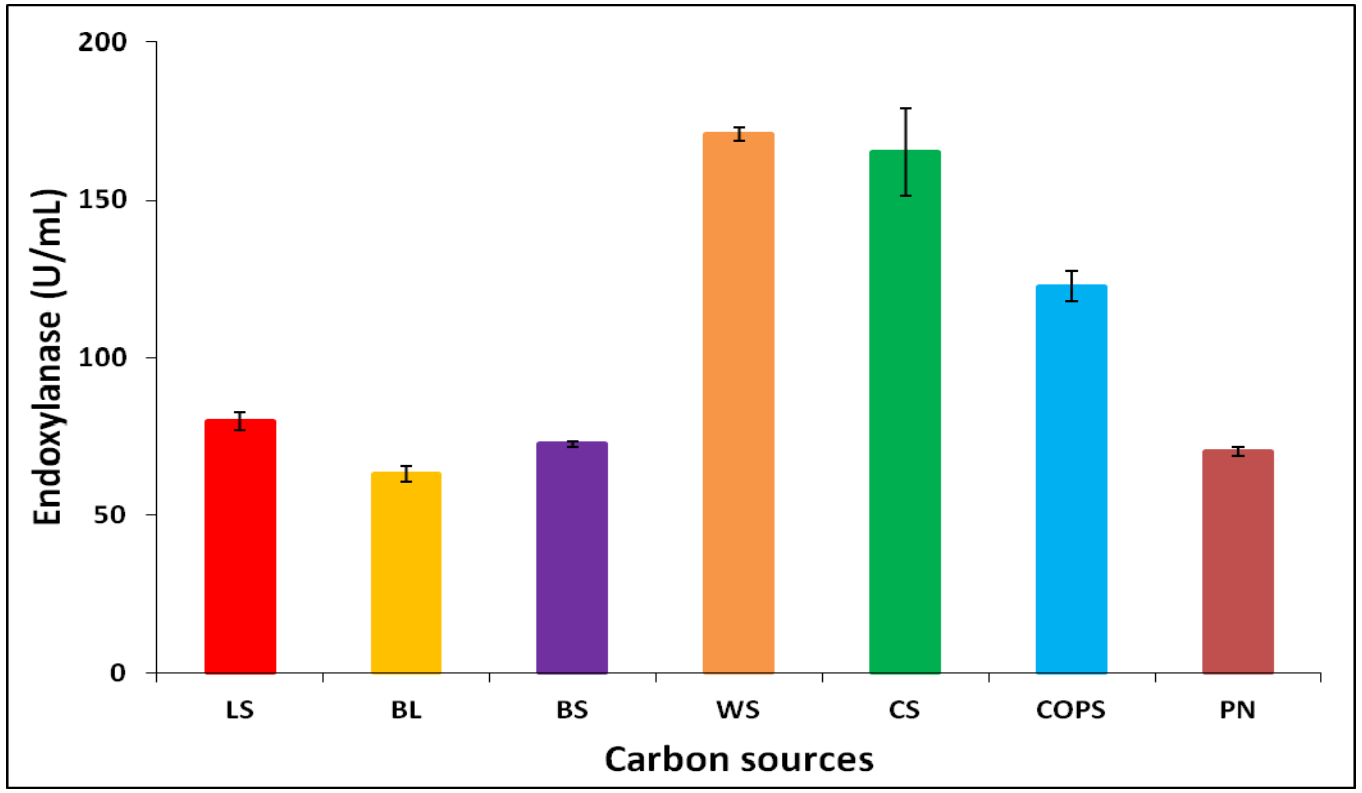

Figure . Effect of different lignocellulosic carbon sources (5 g/L) such as lentil straw (LS), banana leaf (BL), barley straw (BS), wheat straw (WS), corn stover (CS), castor oil plant stalk (COPS) and pine needle (PN) on endoxylanase production from *A. geliboluensis* in MS-YEM. Incubation was performed at 30 °C, 200 rpm for 3 days.

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Improvement of endoxylanase production from A. geliboluensis by using wheat straw as primary carbon source

Effect of particle size of wheat straw on endoxylanase production from A. geliboluensis

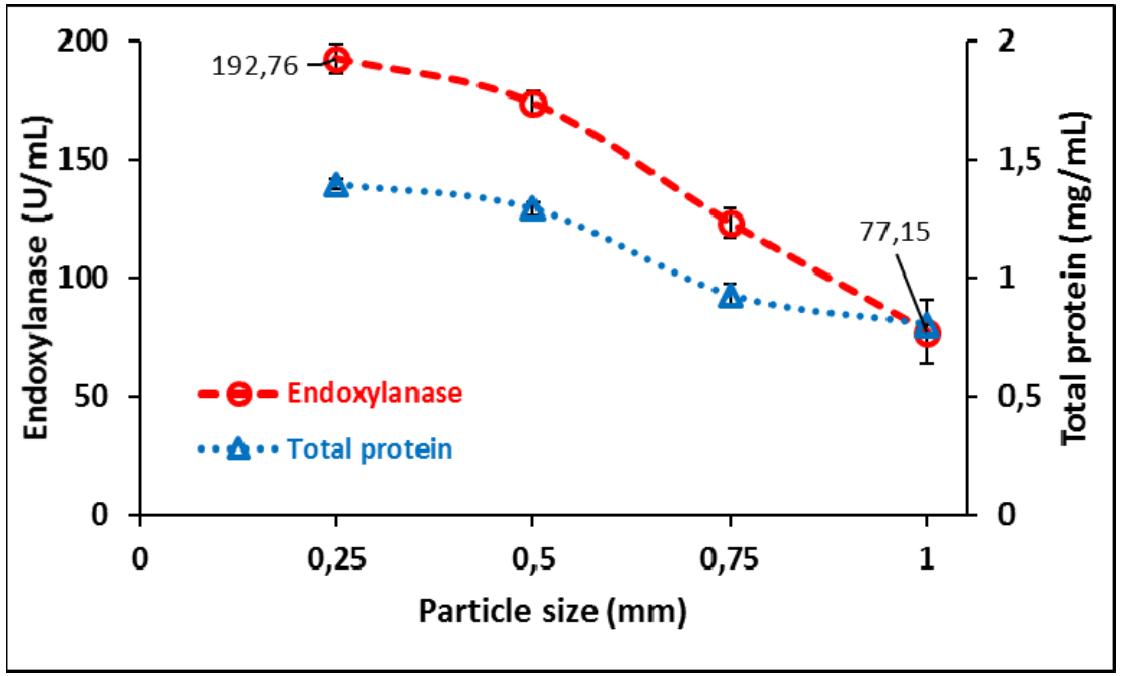

Figure . Effect of particle size of wheat straw (5 g/L) on endoxylanase production from *A. geliboluensis* in MS-YEM. Incubation was performed at 30 °C, 200 rpm for 3 days.

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Effect of nitrogen sources on endoxylanase production from A. Geliboluensis by using wheat straw as primary carbon source

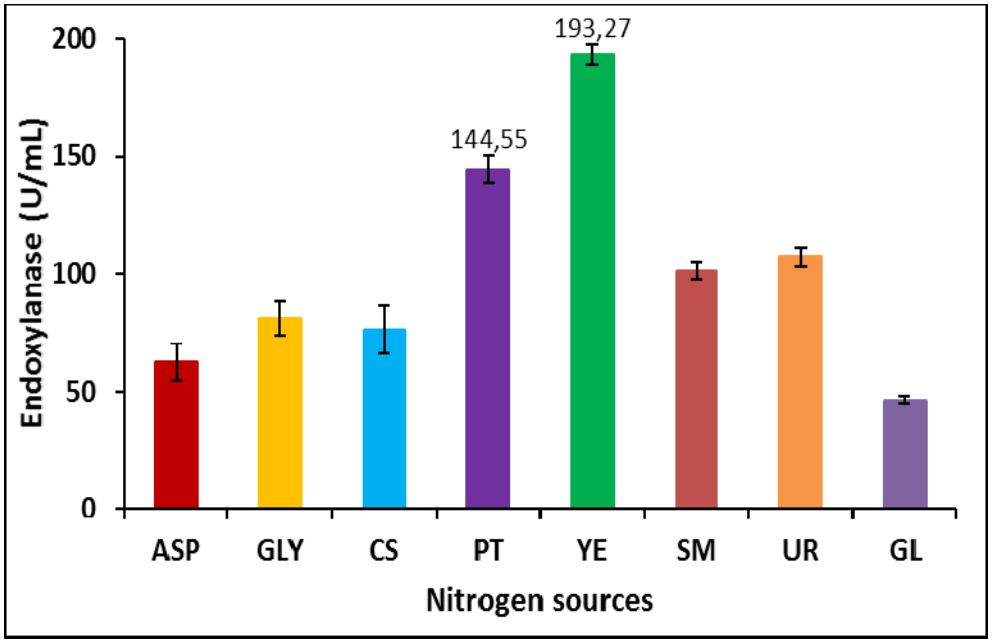

Figure . Effect of nitrogen sources on endoxylanase production from *A. geliboluensis* in MS-YEM supplemented with wheat straw. Incubation was performed at 30 °C, 200 rpm for 3 days. (**ASP:** asparagine, **GLY:** glycine, **CS:** casein, **PT:** peptone, **YE:** yeast extract, **SM:** soybean meal, **UR:** urea, **GL:** gelatin)

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Effect of temperature and initial pH of media on endoxylanase production from A. Geliboluensis by using wheat straw as primary carbon source

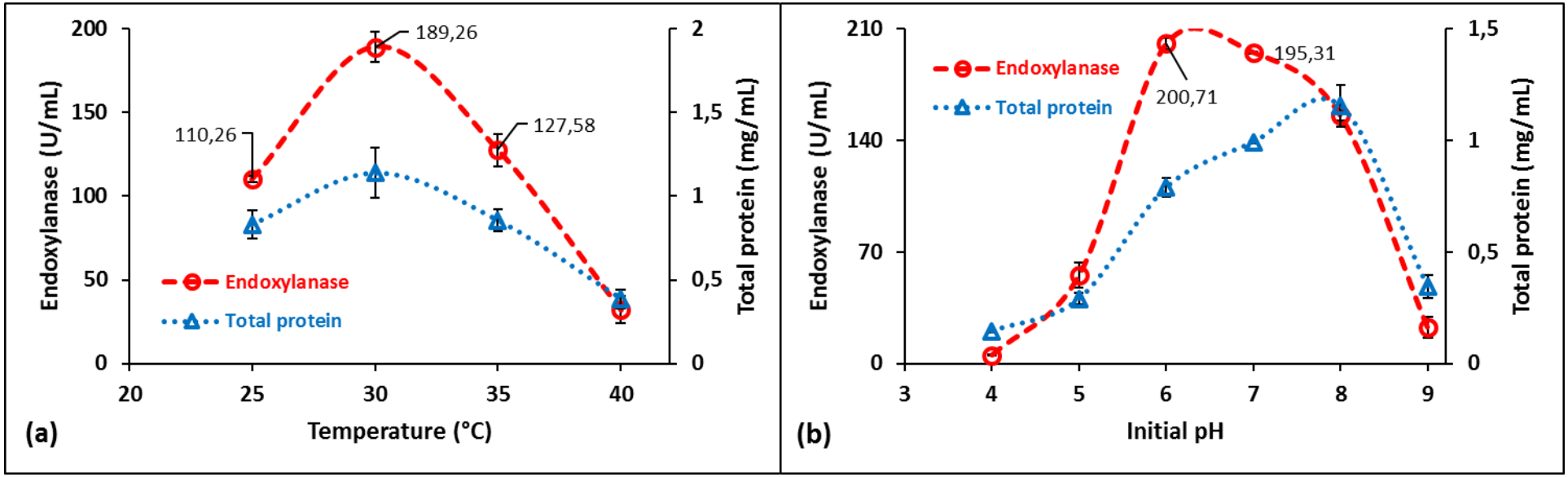

Figure . Effect of temperature and initial pH of media on endoxylanase production from *A. geliboluensis* in MS-YEM. Incubation was performed at 30 °C, 200 rpm for 3 days.

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Effect of agitation on endoxylanase production from A. Geliboluensis by using wheat straw as primary carbon source

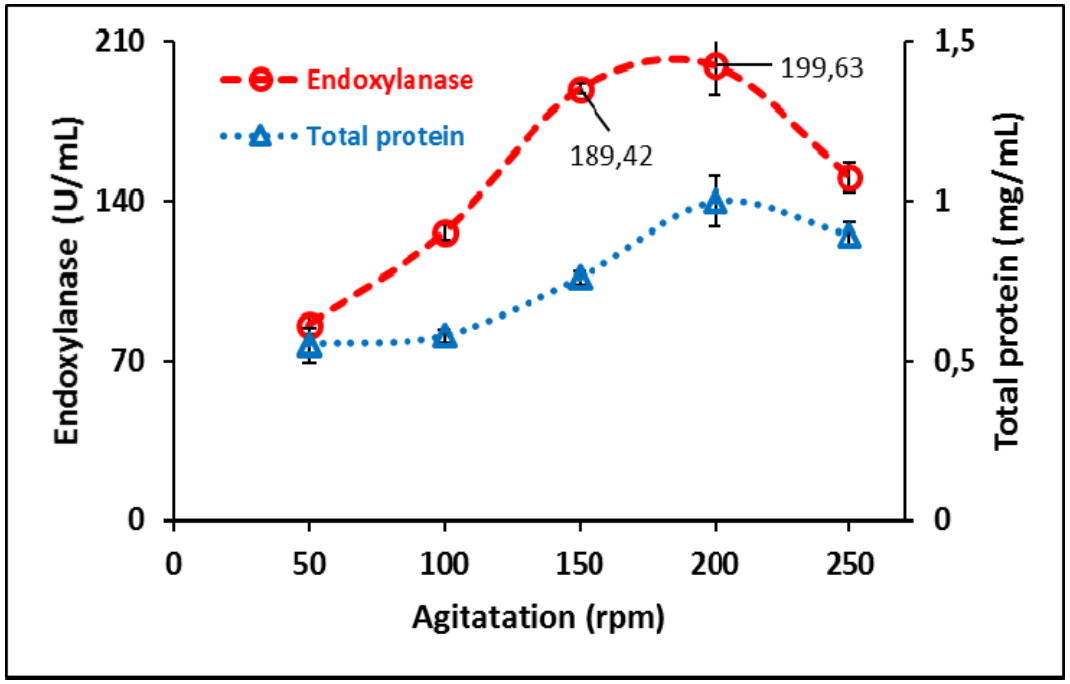

Figure . Effect of agitation on endoxylanase production from *A. geliboluensis* in MS-YEM. Incubation was performed at 30 °C for 3 days. Initial media pH was 6.0

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Improvement of endoxylanase production from A. geliboluensis by using corn stover as primary carbon source

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Effect of particle size of corn stover on endoxylanase production from A. geliboluensis

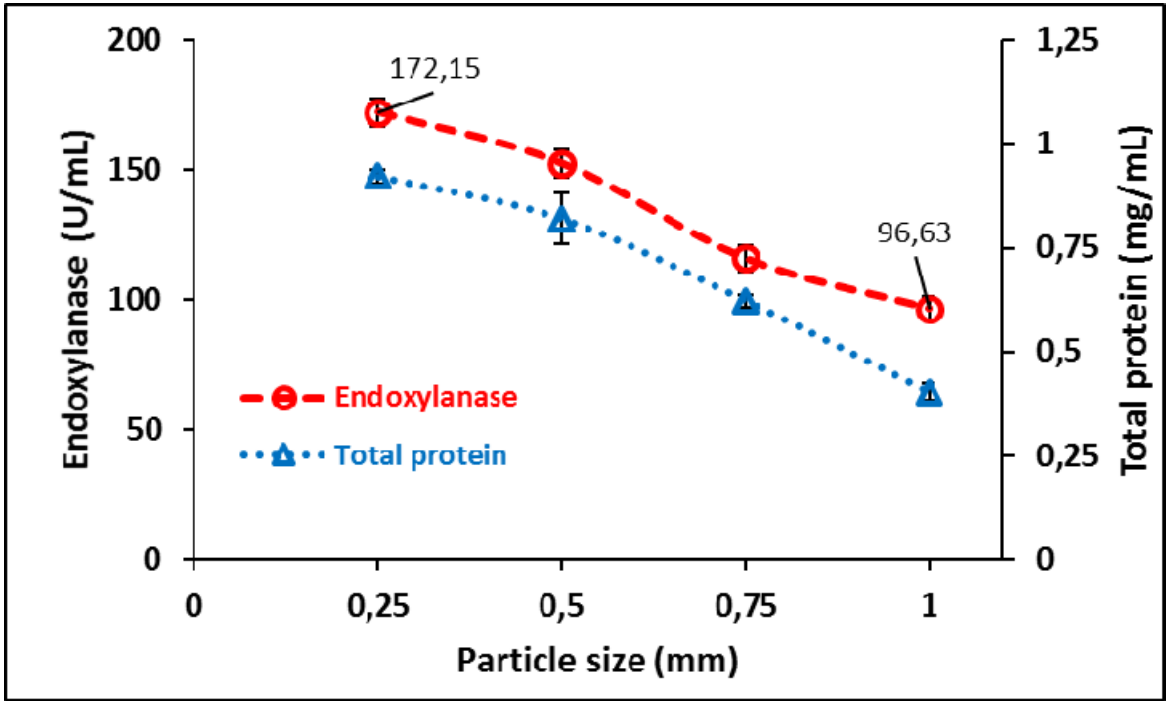

Figure . Effect of particle size of corn stover (5 g/L) on endoxylanase production from *A. geliboluensis* in MS-YEM. Incubation was performed at 30 °C, 200 rpm for 3 days.

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Effect of nitrogen sources on endoxylanase production from A. geliboluensis by using corn stover as primary carbon source

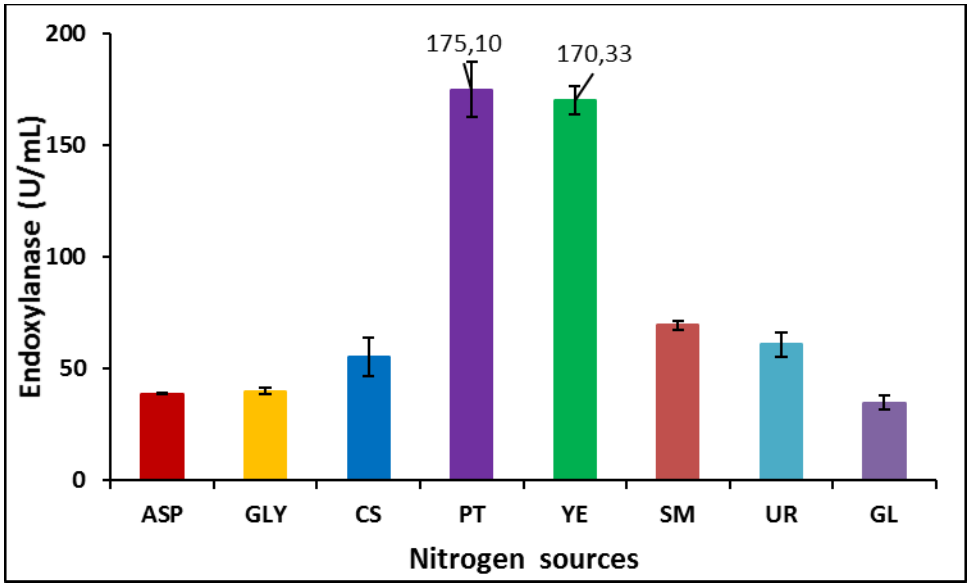

Figure. Effect of nitrogen sources on endoxylanase production from *A. geliboluensis* in MS-YEM supplemented with corn stover. Incubation was performed at 30 °C, 200 rpm for 3 days. (**ASP:** asparagine, **GLY:** glycine, **CS:** casein, **PT:** peptone, **YE:** yeast extract, **SM:** soybean meal, **UR:** urea, **GL:** gelatin)

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Effect of temperature and initial pH of media on endoxylanase production from A. Geliboluensis by using corn stover as primary carbon source

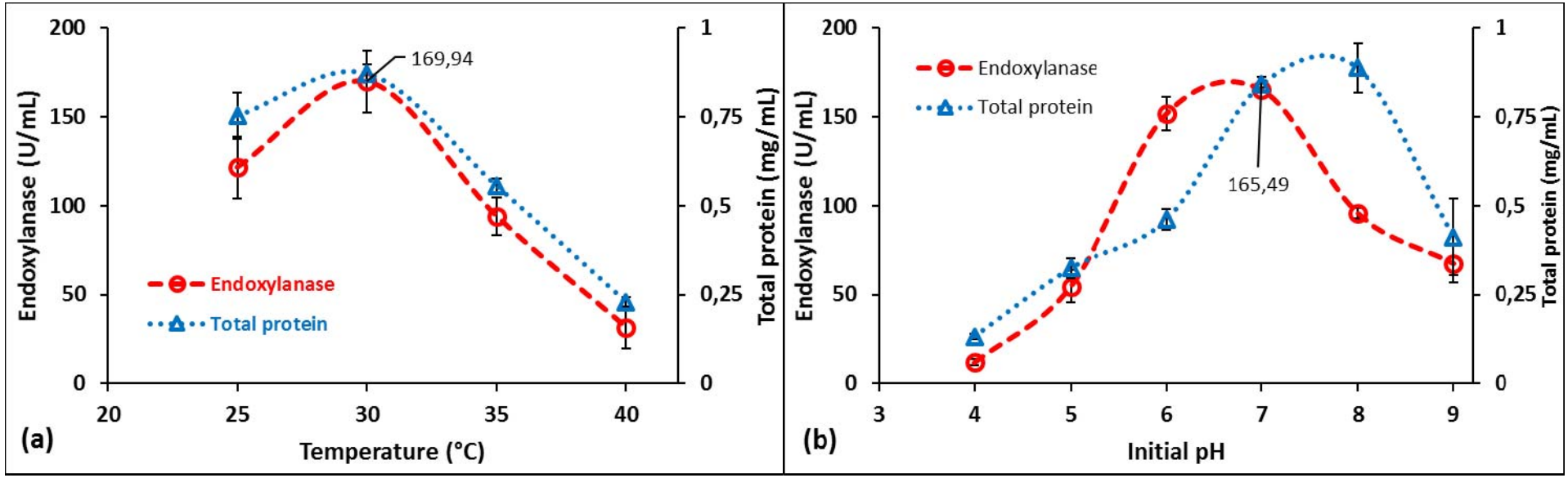

Figure . Effect of temperature and initial pH of media on endoxylanase production from *A. geliboluensis* in MS-YEM. Incubation was performed at 30 °C, 200 rpm for 3 days.

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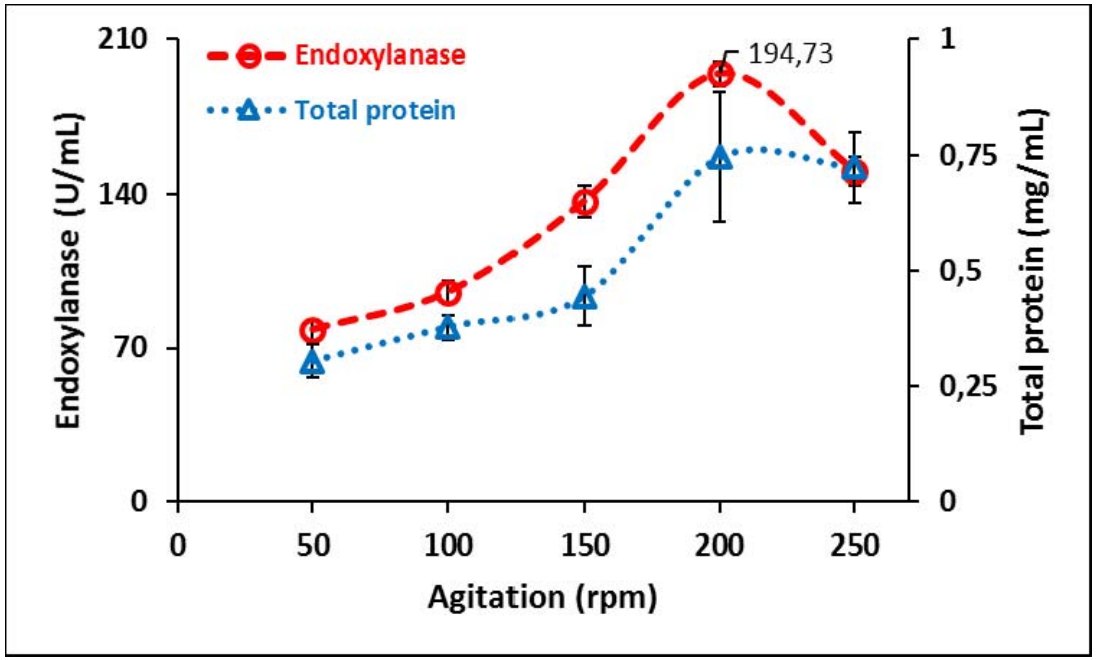

Figure . Effect of agitation on endoxylanase production from *A. geliboluensis* in MS-YEM. Incubation was performed at 30 °C for 3 days. Initial media pH was 7.0

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Improvement of endoxylanase production from A. geliboluensis by using castor oil plant (Ricinus communis)as primary carbon source

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Effect of particle size of castor oil plant on endoxylanase production from A. geliboluensis

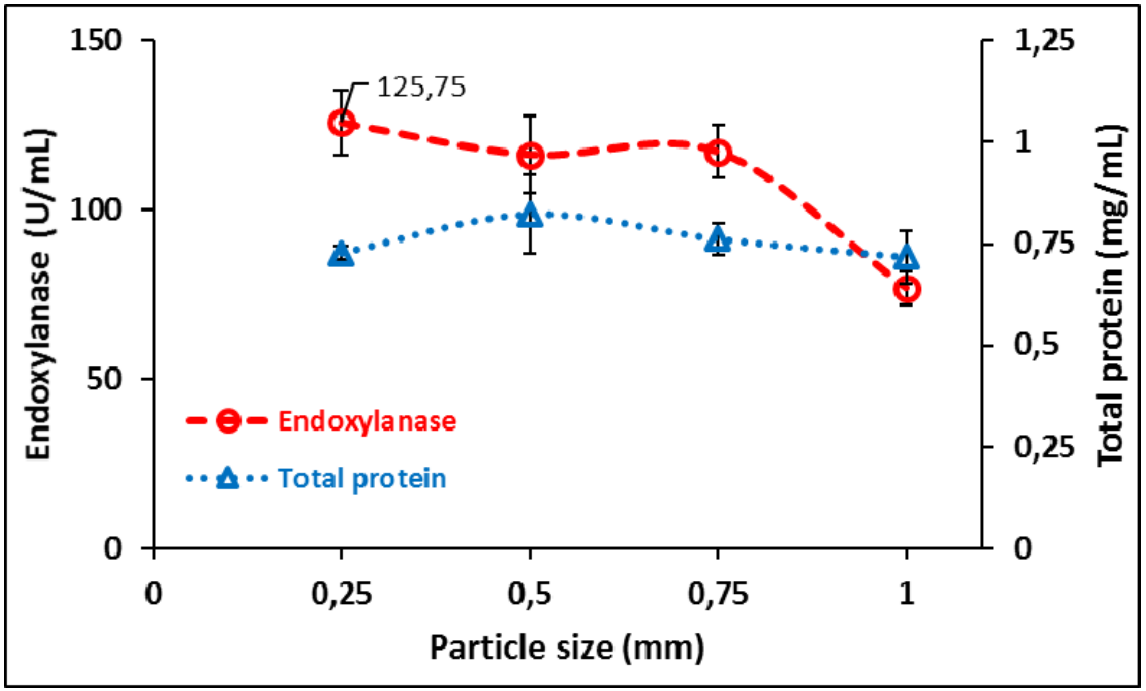

Figure. Effect of particle size of castor oil plant (5 g/L) on endoxylanase production from *A. geliboluensis* in MS-YEM. Incubation was performed at 30 °C, 200 rpm for 3 days.

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Effect of nitrogen sources on endoxylanase production from A. geliboluensis by using castor oil plant as primary carbon source

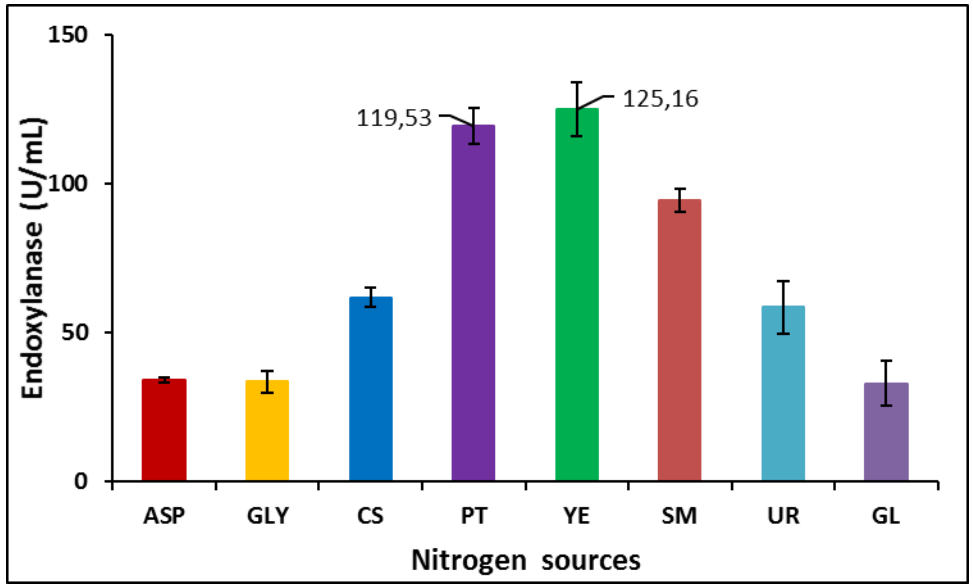

Figure. Effect of nitrogen sources on endoxylanase production from *A. geliboluensis* in MS-YEM supplemented with castor oil plant. Incubation was performed at 30 °C, 200 rpm for 3 days. (**ASP:** asparagine, **GLY:** glycine, **CS:** casein, **PT:** peptone, **YE:** yeast extract, **SM:** soybean meal, **UR:** urea, **GL:** gelatin)

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Effect of temperature and initial pH of media on endoxylanase production from A. geliboluensis by using castor oil plant as primary carbon source

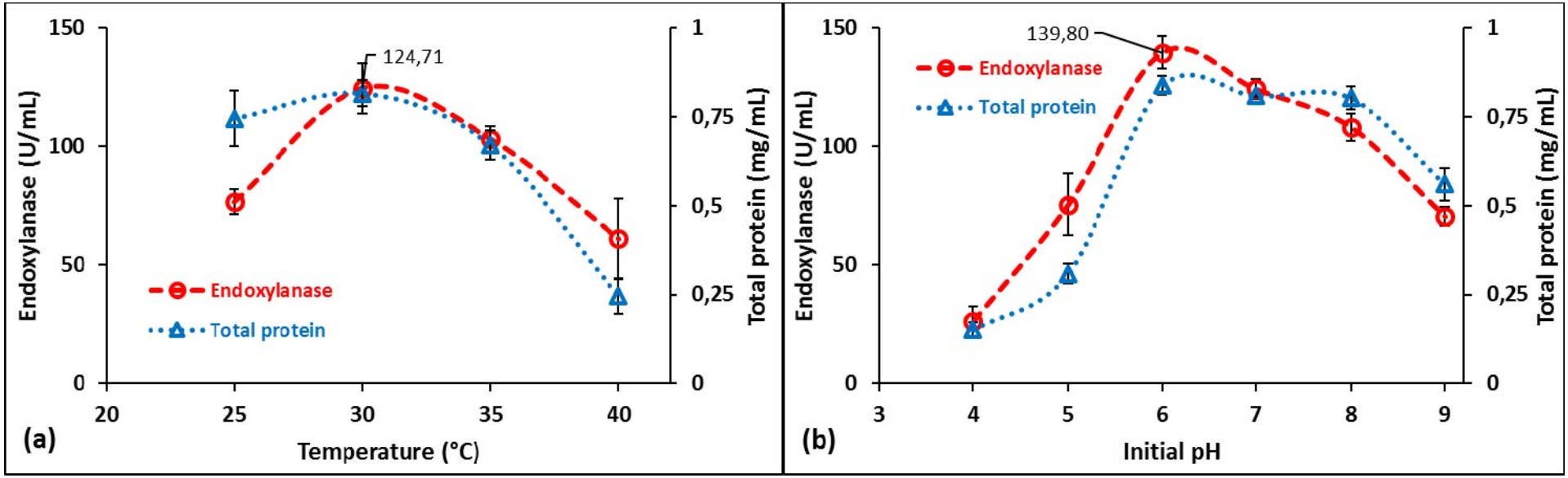

Figure . Effect of temperature and initial pH of media on endoxylanase production from *A. geliboluensis* in MS-YEM. Incubation was performed at 30 °C, 200 rpm for 3 days.

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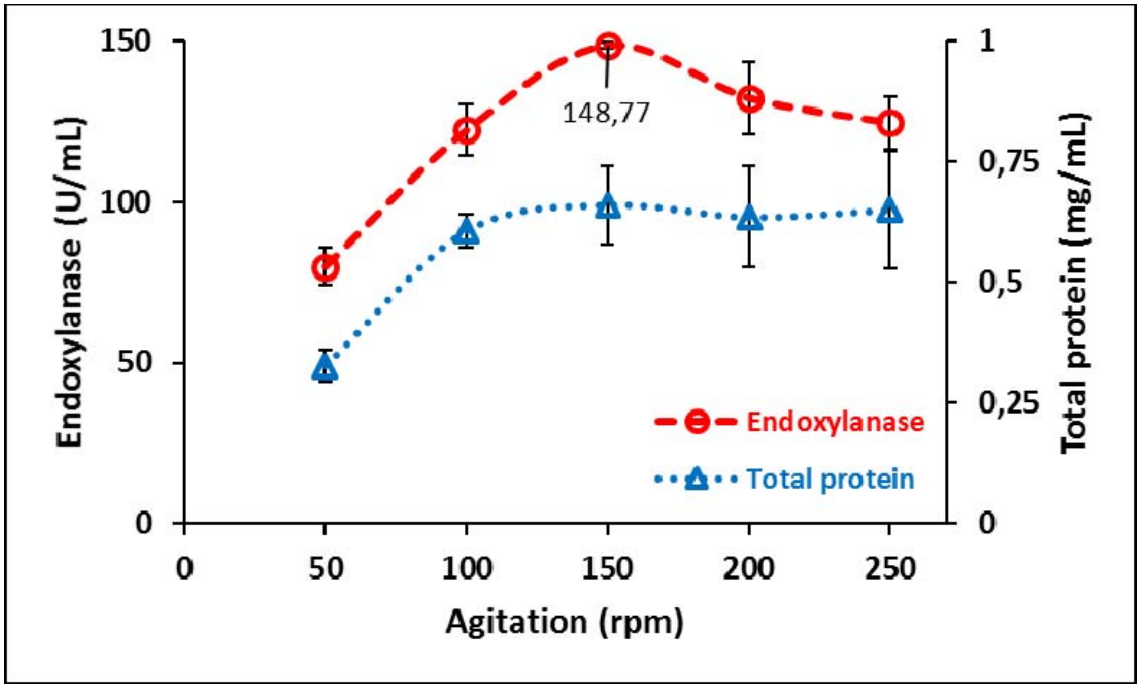

Figure. Effect of agitation on endoxylanase production from *A. geliboluensis* in MS-YEM. Incubation was performed at 30 °C for 3 days. Initial media pH was 6.0

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Extracellular protein profile of A. geliboluensis fermentation broths

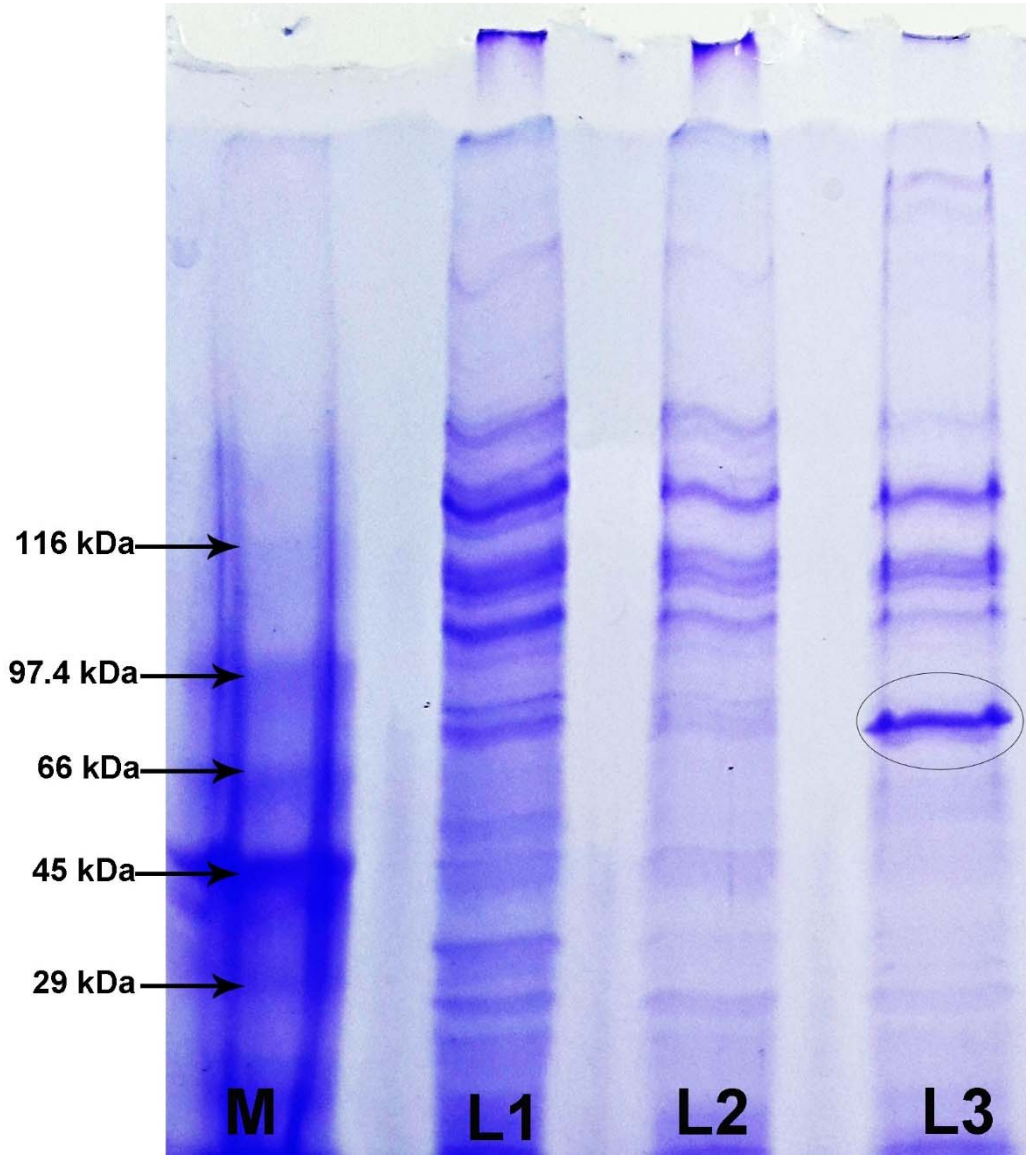

Figure. SDS-PAGE profile of extracellular proteins in fermentation liquid after incubation of A. geliboluensis by using wheat straw (L1), corn stover (L2) and castor oil plant (L3) in MS-YEM. Moleculer marker (M) included carbonic anhydrase (29 kDa), egg albumin (45 kDa), bovine albumin (66 kDa), rabbit phosphorylase b (97.4 kDa) and β-galactosidase (116 kDa).

Zymogram analysis of A. geliboluensis fermentation broths

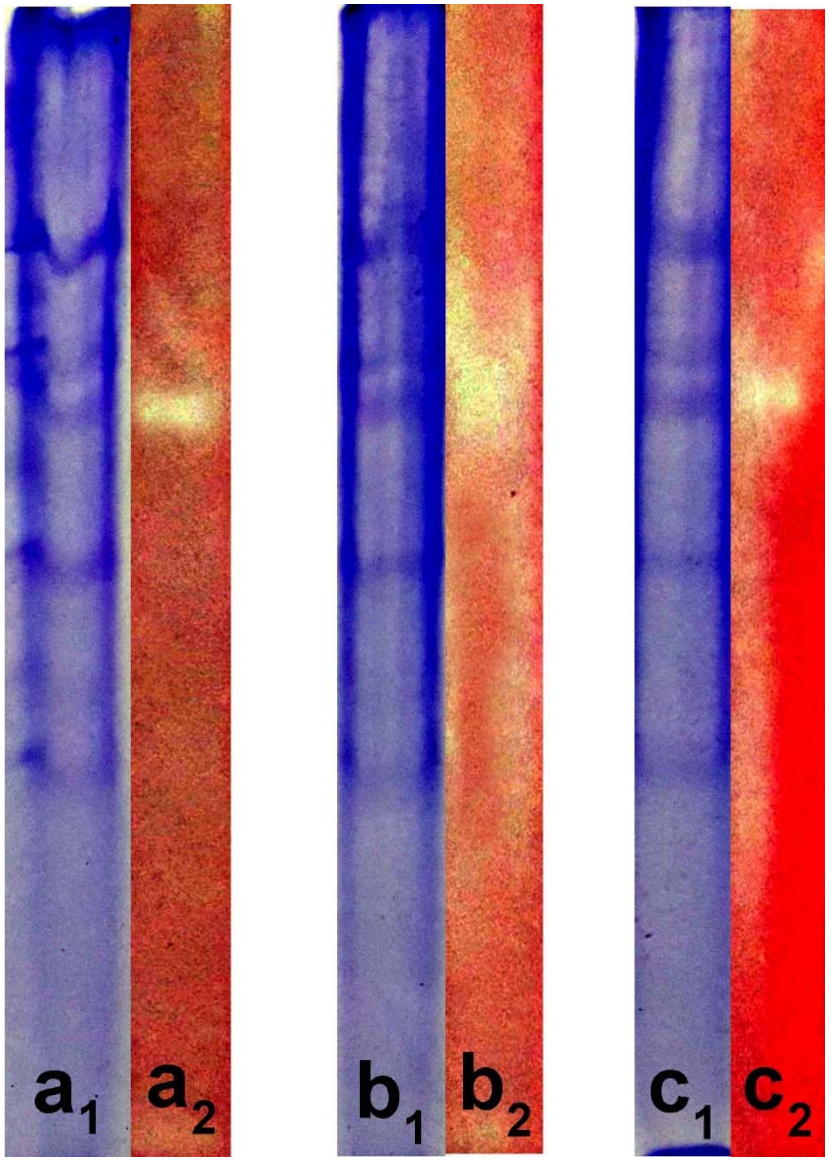

Figure. Native-PAGE and zymography of extracellular proteins in fermentation liquid after incubation of *A. geliboluensis* by using wheat straw (a_1: native PAGE, a_2: zymography), corn stover (b_1: native PAGE, b_2: zymography) and castor oil plant (c_1: native PAGE, c_2: zymography) in MS-YEM.