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DECOLORIZATION OF MOLASSES WASTEWATER FROM DISTILLERIES  
USING BACTERIAL CONSORTIUM

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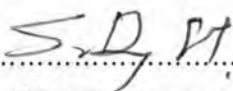
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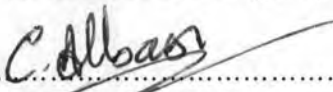
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น้ำเสียจากโรงงานอุตสาหกรรมผลิตแอลกอฮอล์ เช่น สุรา จัดเป็นน้ำเสียที่ก่อให้เกิดมลพิษทางน้ำอย่างมาก เนื่องจากมีปริมาณสารอินทรีย์เจือปนอยู่ปริมาณสูง และมีสีค่าเข้มซึ่งเป็นสีของเมลานอยดิน ที่เกิดขึ้นระหว่างกระบวนการกลั่นสุรา โดยใช้กากน้ำตาลเป็นวัตถุดิบ เมลานอยดินนี้มีความทนทานต่อการย่อยสลายทางชีวภาพสูงมาก ทำให้สามารถคงทนอยู่ในน้ำเสียได้เป็นเวลานานและเมื่อรั่วไหลหรือถูกปล่อยออกสู่แหล่งน้ำธรรมชาติ จะก่อให้เกิดปัญหามลพิษทางน้ำขึ้น ในงานวิจัยนี้ได้คัดแยกกลุ่มแบคทีเรีย CONS8 จากตะกอนน้ำตกจ.แม่ฮ่องสอน ซึ่งมีความสามารถในการกำจัดสีเมลานอยดิน โดยพบว่ากลุ่มแบคทีเรียนี้สามารถลดสีเมลานอยดินในอาหารเลี้ยงเชื้อน้ำเสียสังเคราะห์ที่ใช้ viandox (13.5 เปอร์เซ็นต์โดยปริมาตร), น้ำเสียจากการใช้กากน้ำตาลบิท (41.5 เปอร์เซ็นต์โดยปริมาตร) และน้ำเสียจากการใช้กากน้ำตาลอ้อย (20.0 เปอร์เซ็นต์โดยปริมาตร) เป็นสารสีเมลานอยดิน ได้ 9.5, 8.0 และ 17.5 เปอร์เซ็นต์ ตามลำดับ ผลการจำแนกกลุ่มแบคทีเรีย CONS8 โดยการแยกเชื้อและจำแนกเชื้อโดยอาศัยลำดับ 16S rDNA พบว่าประกอบด้วยแบคทีเรีย 4 สายพันธุ์ และเมื่อนำแบคทีเรีย 4 สายพันธุ์นี้มาทดสอบหาแบคทีเรียผสมที่เหมาะสมในการลดสีเมลานอยดิน พบว่าแบคทีเรียผสม MMP1 ซึ่งประกอบด้วย *Klebsiella oxytoca*, *Serratia mercrescens* และแบคทีเรียที่ยังไม่สามารถจำแนกได้ (DQ817737) สามารถลดสีได้ดีที่สุด 18.3 เปอร์เซ็นต์ ภายในเวลา 2 วัน โดยเมื่อเปรียบเทียบผลการลดสีของ MMP1 กับชุดการทดลองที่ไม่มีการเติมเชื้อ พบว่า การลดสีเมลานอยดินเกิดจากความสามารถของเชื้อ และไม่มีการดูดซับเมลานอยดินของกลุ่มเชื้อ MMP1 โดยพบว่าการเพิ่มสารอาหาร และวิตามินบีไม่สามารถเพิ่มประสิทธิภาพในการลดสีของกลุ่มแบคทีเรียนี้ได้ ในการศึกษาความสามารถการลดสีเมลานอยดินโดยกลุ่มเชื้อ MMP1 ในระบบเมมเบรนในถังปฏิกรณ์ชีวภาพ ที่ค่าระยะเวลาเก็บกักน้ำต่างๆ ได้แก่ 15, 20 และ 40 ชั่วโมง โดยมีการศึกษาประสิทธิภาพการทำงานของระบบด้วยการวิเคราะห์ ค่าความต้องการออกซิเจนทางเคมี (ซีโอดี), ค่าสีที่ลดลง และมวลชีวภาพในถังปฏิกรณ์ พบว่าระบบสามารถกำจัดสีเมลานอยดินและสารอินทรีย์ได้ดีที่สุดเมื่อให้ระยะเวลาเก็บกักน้ำ (HRT) นานขึ้น

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SUHUTTAYA JIRANUNTIPON : DECOLORIZATION OF MOLASSES WASTEWATER FROM DISTILLERIES USING BACTERIAL CONSORTIUM.  
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Distillery effluent from sugarcane molasses leads to an environmental pollution due to its large volume and the presence of dark brown colored compounds, known as melanoidins. In this study, a bacterial consortium CONS8 isolated from waterfall sediments in Maehongsorn province was selected as a molasses-decolorizing consortium. Consortium CONS8 was able to decolorize, only within 2 days, in Erlenmeyer flasks, three different synthetic wastewaters containing either Viandox sauce (13.5% v/v), beet molasses wastewater (41.5% v/v) or sugarcane molasses wastewater (20% v/v) at 9.5, 8.0 and 17.5%, respectively. Four predominant bacteria present in the consortium CONS8 were identified by the 16S rDNA analysis. To achieve the highest decolorization, the artificial bacterial consortium MMP1 comprising *Klebsiella oxytoca*, *Serratia mercerscens* (T2) and unknown bacterium DQ817737 (T4), was constructed. Under optimized conditions (aeration, pH), the bacterial consortium MMP1 was able to decolorize the synthetic melanoidins-containing wastewater at 18.3% within 2 days. The comparison of decolorization by the consortium MMP1 with abiotic control proved that the color removal for synthetic melanoidins-containing wastewater medium was mainly due to biotic activity of bacterial cells, without any adsorption phenomena. Supplement of nutrients and vitamin B did not promote melanoidins decolorization by bacterial consortium MMP1. Finally, the performance of a membrane bioreactor (MBR) for synthetic melanoidins-containing wastewater treatment was investigated at laboratory scale, with a mineral membrane. The reactor seeding was made with the MMP1 bacterial consortium inoculum. The reactor was performed with several hydraulic retention times (HRT) of 15, 20, and 40 hours. The performances were analyzed in terms of COD, color removal and biomass in the reactor. The results indicated that the higher COD and color removal efficiency were achieved with the longer HRT.

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