ISOLATION AND CHARACTERIZATION OF A *DESMODESMUS SPECIES* FROM VIETNAM WITH POTENTIAL FOR THE PRODUCTION OF ANIMAL FEEDSTOCKS AND NUTRACEUTICALS.

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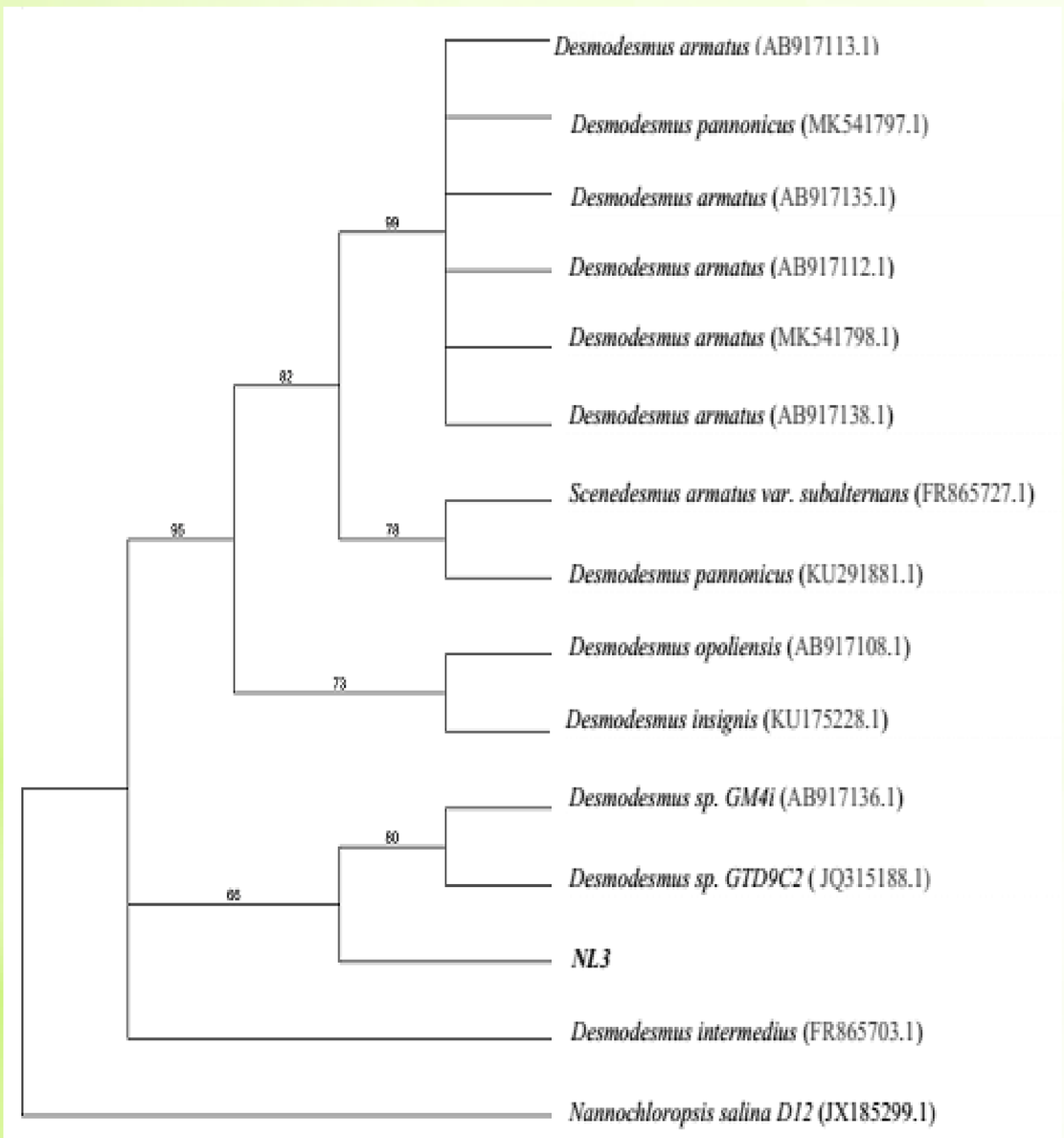
1. Introduction

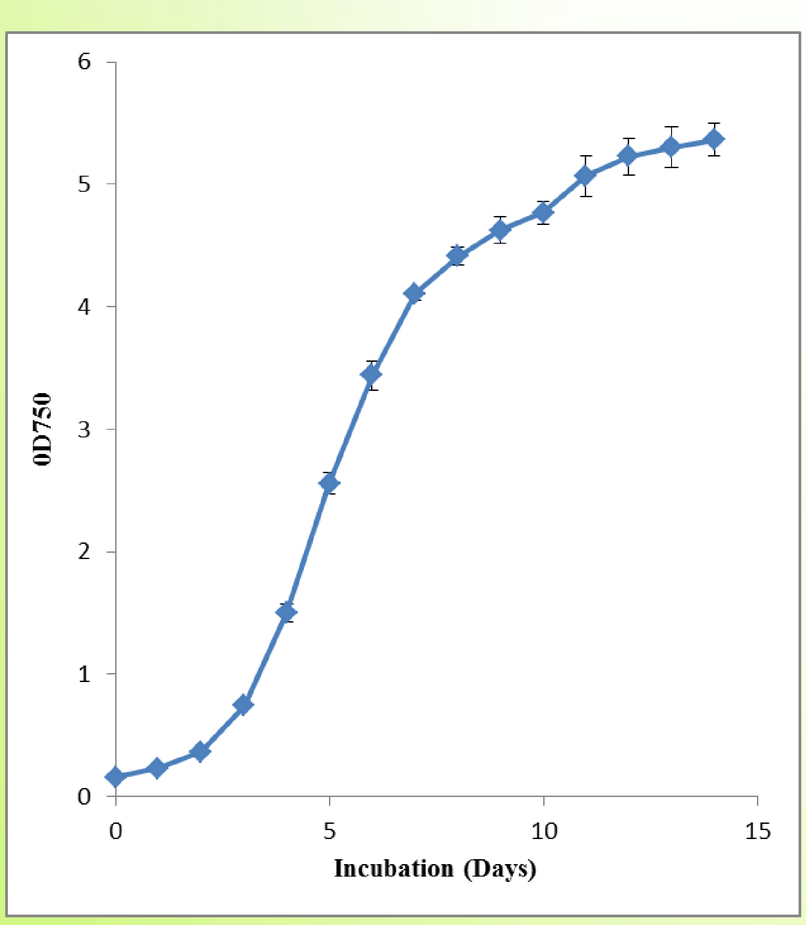
The isolation of microalgae was conducted using water sample collected from cultivation pond located in the central province of Ninh Thuan, Vietnam. Phylogenetic analysis based on partial sequence of 18S rDNA-ITS region showed that isolate NL3 belonged to genus *Desmodesmus.* Microalga *Desmodesmus sp. NL3* was characterized in terms of growth, protein, fatty acid and pigment profiles. Furthermore, salinity tolerance experiment was also conducted on *Desmodesmus sp. NL3* in a range of salinity conditions (10, 20, 30 and 35‰). The effects of salinity conditions on its growth, production of biomass, protein, fatty acids and pigments were evaluated.

2. Results

Isolation and identification: The rooted - phylogenetic tree based on partial 18S rDNA – ITS1-5.8S-ITS2 sequence showed that strain *Nl3* belonged to genus *Desmodesmus.* In the tree, *Nannochloropsis salina D12* (JX185299.1) was defined as an outgroup.



Growth of *Desmodesmus sp. NL3* with the biomass harvested at stationary phase of 1.54 ± 0.06 g L^{-1} (Tris Acetate Phosphate medium, 25°C, 200 µmol $m^{-2}s^{-1}$ light intensity)



Biomass and protein contents (stationary phase) of *Desmodesmus sp. NL3* in different salinities at light intensity of 200 µM $m^{-2}s^{-1}$

Parameter	Salinity				
	0‰ (Control)	10‰	20‰	30‰	35‰
Biomass yield (g L^{-1})	1.54 ± 0.06	1.19 ± 0.04	1.41 ± 0.03	1.21 ± 0.02	1.12 ± 0.004
Protein content (% DW)	26.3 ± 1.99	40.54 ± 2.96	38.07 ± 0.29	39.26 ± 1.71	31.93 ± 2.55

Desmodesmus sp. NL3 was shown to be highly tolerant to different salinities. Biomass contents remained high (>1 g/lit) among conditions while protein contents in salinity conditions were higher than in the control sample.

Fatty acid profiles (stationary phase) of *Desmodesmus sp. NL3* in different salinities at light intensity of 200 µM $m^{-2}s^{-1}$

Fatty acid	%TFA in different salinities				
	0‰ (Control)	10‰	20‰	30‰	35‰
C_{14}	nd	nd	nd	nd	nd
C_{16}	25.70 ± 1.75	19.00 ± 0.33	17.54 ± 1.95	18.05 ± 0.63	21.53 ± 0.51
$C_{16:1}$	nd	nd	nd	1.51 ± 0.27	3.62 ± 0.36
C_{18}	nd	nd	nd	nd	0.55 ± 0.54
$C_{18:1\ cis}$	27.73 ± 1.27	9.47 ± 0.97	6.04 ± 0.21	14.64 ± 0.51	26.23 ± 2.69
$C_{18:2\ cis}$	21.74 ± 0.41	27.70 ± 0.89	22.71 ± 1.01	23.60 ± 1.24	19.22 ± 0.47
$C_{18:3\ cis}$	**24.83 ± 2.20**	**43.83 ± 1.79**	**53.71 ± 2.35**	**42.20 ± 0.78**	**29.03 ± 3.79**
Σ SFA	25.70 ± 1.75	19.00 ± 0.33	17.54 ± 1.95	18.05 ± 0.63	21.90 ± 0.93
Σ MUFA	27.73 ± 1.27	9.47 ± 0.97	6.04 ± 0.21	16.14 ± 0.43	29.85 ± 2.85
Σ PUFA	**46.57 ± 2.44**	**71.53 ± 1.30**	**76.42 ± 1.76**	**65.80 ± 0.58**	**48.26 ± 3.78**
%DW	8.65 ± 0.50	9.35 ± 0.69	8.53 ± 0.17	11.14 ± 0.15	15.59 ± 1.98

Total fatty acid contents were similar among salinities, except for salinity of 35‰ with 15.59 (%DW). The amount of $C_{18:3}$ in different salinity treatments were greater than in the control sample, resulting in the high content of PUFAs in those treatments. Salinity treatments therefore favored the production of PUFAs.

Pigment profiles (stationary phase) of *Desmodesmus sp. NL3* in different salinities at light intensity of 200 µM $m^{-2}s^{-1}$

Pigment (mg/g DW)	Salinity				
	0‰ (Control)	10‰	20‰	30‰	35‰
Lutein	**1.63 ± 0.24**	**4.01 ± 0.55**	**7.00 ± 0.24**	**5.67 ± 0.17**	**2.24 ± 0.72**
Neoxanthin	0.13 ± 0.08	0.58 ± 0.14	1.01 ± 0.10	0.85 ± 0.28	0.17 ± 0.09
Violaxanthin	0.31 ± 0.07	1.25 ± 0.13	1.38 ± 0.11	0.67 ± 0.14	0.56 ± 0.18
Antheraxanthin	0.13 ± 0.03	0.23 ± 0.01	0.00 ± 0.00	0.32 ± 0.28	0.01 ± 0.02
Chl b	2.16 ± 0.09	7.78 ± 0.64	9.03 ± 0.26	7.30 ± 0.36	3.34 ± 0.78
Chl a	6.82 ± 0.33	25.52 ± 2.28	33.15 ± 0.72	24.39 ± 1.16	10.49 ± 2.91
β-Carotene	0.18 ± 0.02	1.02 ± 0.17	1.45 ± 0.03	1.08 ± 0.11	0.42 ± 0.13
Astaxanthin	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.00 ± 0.00	0.16 ± 0.03
Canthaxanthin	0.01 ± 0.00	0.03 ± 0.00	0.04 ± 0.02	0.01 ± 0.01	0.04 ± 0.00

Compared to the control condition, contents of most pigment components are changed in salinity treatments and remained high. Notably, lutein contents in those treatments are higher and the highest content was recorded at salinity of 20‰ with 7 (mg/g DW). Therefore, salinity treatment on *Desmodesmus sp. NL3* was proven to be condition to enhance the production of lutein.

3. Conclusion

This study has isolated a microalga which was identified as *Desmodesmus sp. NL3*. The strain has high productivity of biomass and protein and high tolerance to salinity. This strain is suitable for production of animal feedstock and especially nutraceuticals due to its high content of PUFAs and valuable carotenoid pigment of lutein. Salinity treatment was demonstrated to be used as a condition for the production of PUFAs, lutein and β-Carotene.

Acknowledgments

This work has received financial support from Académie de Recherche et Enseignement Supérieur (ARES) (Research Project for Development, Renewable).