

(*Lactuca sativa* L.)

(2007/10/1 2007/7/23)

.(*Lactuca sativa* L. cv. Longiflora)

MS

KNO₃ NH₄NO₃ / (95 82.5)

(60)

KNO₃ NH₄NO₃ / (19 16.5)

KNO₃ NH₄NO₃ / (285 16.5)

(15.33)

(18.76)

(60)

/ 0.520

/ 0.550

Effect of Different Concentrations of Ammonium Nitrate and Potassium Nitrate in Growth and Differentiation of Lettuce Plant (*Lactuca sativa* L.) and Protein content

Amjad A. Mohammad

Department of Biology

College of Science

Mosul University

ABSTRACT

The results indicated that addition of (82.5 and 95) g/L NH_4NO_3 and KNO_3 respectively to MS medium enhanced greatly shoot formation after (60) days of growth. The MS medium supplemented with (16.5 and 19) g/L NH_4NO_3 and KNO_3 respectively greatly promote the formation of large number of roots. The best medium sustained callus growth was MS medium supplemented with (16.5 and 285)g/L NH_4NO_3 and KNO_3 respectively. Moreover fresh weight reached (18.76)g compared with (15.33)g that on standard medium, with increase in protein in the latter medium reach 0.550 mg/g as compared with 0.520 mg/g on standard medium after (60) days of growth. It can be concluded that the addition of potassium nitrate to standard nutrient medium at different concentrations enhanced the growth and differentiation of lettuce plant callus compared with ammonium nitrate.

.(1990 ; Street, 1977)

; Pierik, 1987)

.(1988

)

(

.(Linkohr et al., 2002 ; Campbell et al., 2000)

.(Macronutrient)

.....

(N)
Coenzymes Porphyrins Purines Pyrimidines
NH₄⁺ (N) .(1977)
NO₂⁻ NO₃⁻
Nitrate Reductase
.(Taiz and Zeiger, 1998 ; Raven et al., 1986)

(*Lactuca sativa* L.)
%96 .%95-90
(% 6.4)
) (10)
.(2004 ; 2001

Arnon and Hoagland,)
° 2±20 .(1940: 1944
(21)

MS (1.5-1)
4×10⁻⁶ (BA) Benzyladenine (Murashige and Skoog, 1962)
() 3×10⁻⁶ (NAA) Naphthaleneacetic acid
° 2±20 (Mohammad and Abood, 1989)
(8) (16) (1500)

: KNO₃ NH₄NO₃
KNO₃ / (248 82.5 16.5 0)
(1) NH₄NO₃
/ (285 95 19 0)

60 40 20

60 40

(/)

: 1

285	95	19	0	KNO₃ / NH₄NO₃ /
5	4	3	2	0
9	8	7	6	16.5
13	12	11	10	82.5
17	16	15	14	248

/ 190

/ 165

(1)

17-2

:

60 40

(TCA) Trichloroacetic acid

5/ 2000g

(%5 TCA)

(1N NaOH)

(1)

° 4

%5

(

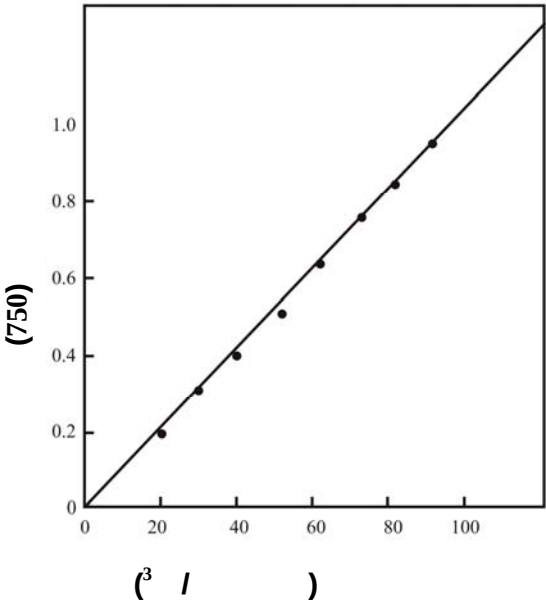
48

(1N NaOH)

.(Lowry et al., 1951) Lowry

(1)

.....



Lowry : 1

: KNO₃ NH₄NO₃

: -

(11) (1-)

(2) (60) (17) (2.3)

KNO₃ NH₄NO₃ / (95 82.5)

(α+40) (α+20)

/ (285) .(2-) (60) (3.5)

(60) (15) (2) (9) KNO₃

NH₄NO₃ (3-) -2-

KNO₃

.

: -

KNO₃ NH₄NO₃ / (19 82.5 95 0 0 0)

. (0.3 0.5 0.4) (2 2 1)

KNO₃ NH₄NO₃ / (19 16.5)

(60) (3.5) (9)
 .(4-) - 2-
 : -
 KNO_3 NH_4NO_3
 . (60)
 1-2- (15.33)
 . (1-)
 KNO_3 NH_4NO_3 / (285 16.5)
 .(5-) 9-2- (18.76)
 .(6-) 8-2- KNO_3 NH_4NO_3 / (95 16.5)
 KNO_3
 / (0 248 0 0) .(-2-) NH_4NO_3
 (60) KNO_3 NH_4NO_3
 .(14 - 2 2 -2 -) (4.98-5.1)
 : -
 (3)
 . (60)
 0.550 KNO_3 NH_4NO_3 / (285 16.5) MS
 (9-3-) (60) /
 .(1-3-) / 0.520
 NH_4NO_3 / (248) MS
 (60) / 0.131-0.201
 .(14-3 2-3-)

MS

4x10⁻BA3x10⁻⁶NAAKNO₃NH₄NO₃

60 , 40 ,206

: 2

40					20						
	-	11	0.15±1.9	7	-	-	9	0.2±1	4	190	165
	-	19	0.12±0.9	4	-	-	15	0.08±0.4	3	0	0
2	1	7	0.4±1.2	3	-	-	5	0.32±0.7	2	19	0
0.3	2	4	0.09±1	4	-	-	4	0.15±0.3	2	95	0
	-	α+10	0.15±1.2	7	-	-	α+6	0.11±1.1	7	285	0
	-	18	0.02±1.3	5	-	-	11	0.09±0.2	5	0	16.5
±2	8	α+8	0.31±1.2	α+5	0.09±1.9	7	-	-	α	19	16.5
	-	α+8	0.6±1.2	3	-	-	5	0.05±0.6	2	95	16.5
	-	α+2	0.09±2	2	-	-	α	1.5	1	285	16.5
	-	α	0.22±1.5	3	-	-	α	-	-	0	82.5
2	1	3	0.6	1	-	-	-	-	-	19	82.5
	-	α+22	0.61±2.8	α+9	-	-	α+9	0.32±1.8	α+4	95	82.5
	-	α+3	0.3±0.9	2	-	-	α+2	0.16±0.4	2	285	82.5
	-	α+3	0.9	1	-	-	α	0.6	1	0	248
	-	2	0.3	1	-	-	2	0.1	1	19	248
	-	α+2	0.4	1	-	-	α	0.2	1	95	248
	-	3	0.1	2	-	-	1	0.1	1	285	248

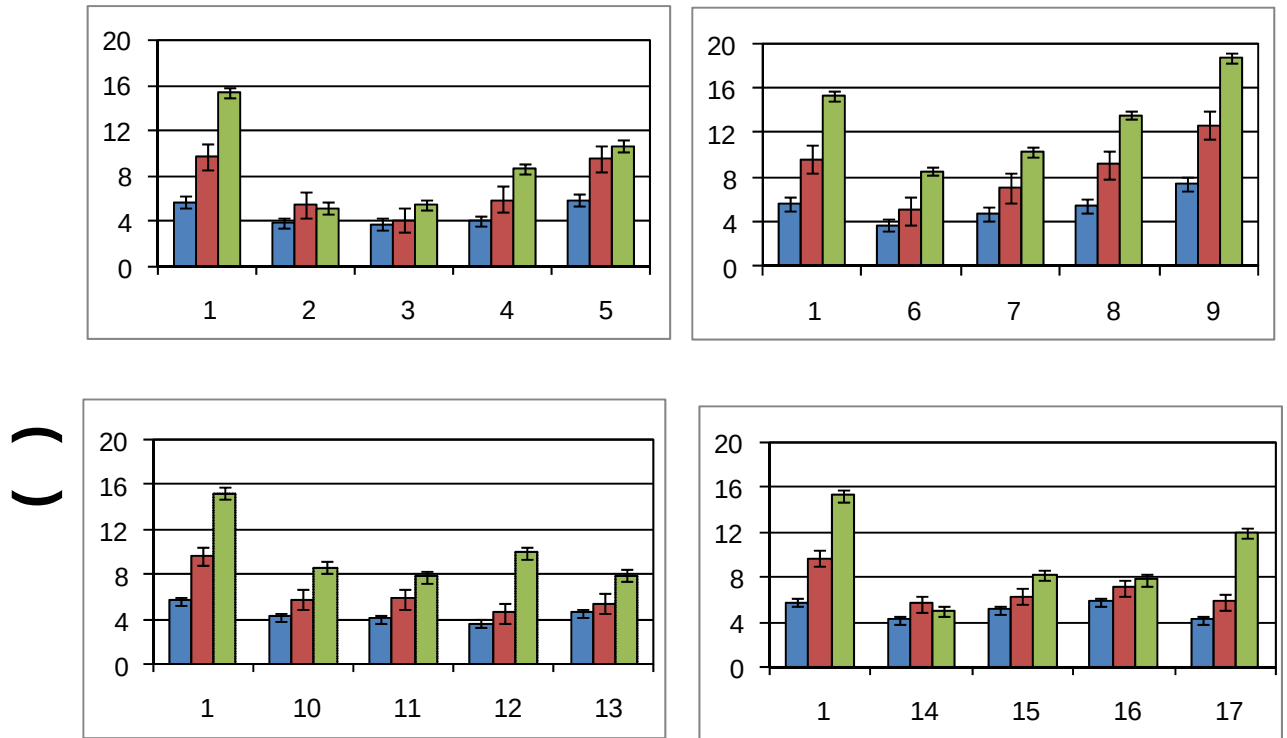
(-) .

± . 5

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α .

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(■) 60 (■) 40 (■) 20
NAA KNO₃ NH₄NO₃
MS
BA 4x10⁻⁶ 3x10⁻⁶
(5) (1)
I

(N)

.(Taiz and Zeiger , 1998)

KNO₃ NH₄NO₃

NAA 3x10⁻⁶ MS

) BA 4×10^{-6}
 .(2000 ; 1999
 / (95 82.5) .
 KNO_3 NH_4NO_3
 . KNO_3 NH_4NO_3 / (285 0)
 (2002)
 NO_3^- NH_4^+ NO_3^- NH_4^+
 .(Hopkins , 1995)
 Cardwell) NO_3^- NH_4^+
 (Palaniswamy et al., 2002 ; and Okonkwo, 1996

.
 .(Vessey et al., 1990 ; Bellaloui and Pilbeam, 1990)
 . KNO_3 NH_4NO_3 / (19 16.5)
 10:1 KNO_3 NH_4NO_3
 .
 ; Vessey et al., 1990)
 .(Hopkins , 1995

(60) KNO_3 NH_4NO_3 / (285 16.5)
 . KNO_3 NH_4NO_3 / (95 16.5)
 NO_3^- K^+ . NH_4NO_3 KNO_3
 K^+

.

NO_3^- (2002 ; Taiz and Zeiger, 1998)
 (N)

RNA DNA

; Palaniswamy et al., 2002 ; 1977)

.(2005

(
/
(

(■) 60 (■) 40 (/) : 3

KNO₃ NH₄NO₃ MS
4x10⁻⁶ BA 3x10⁻⁶ NAA

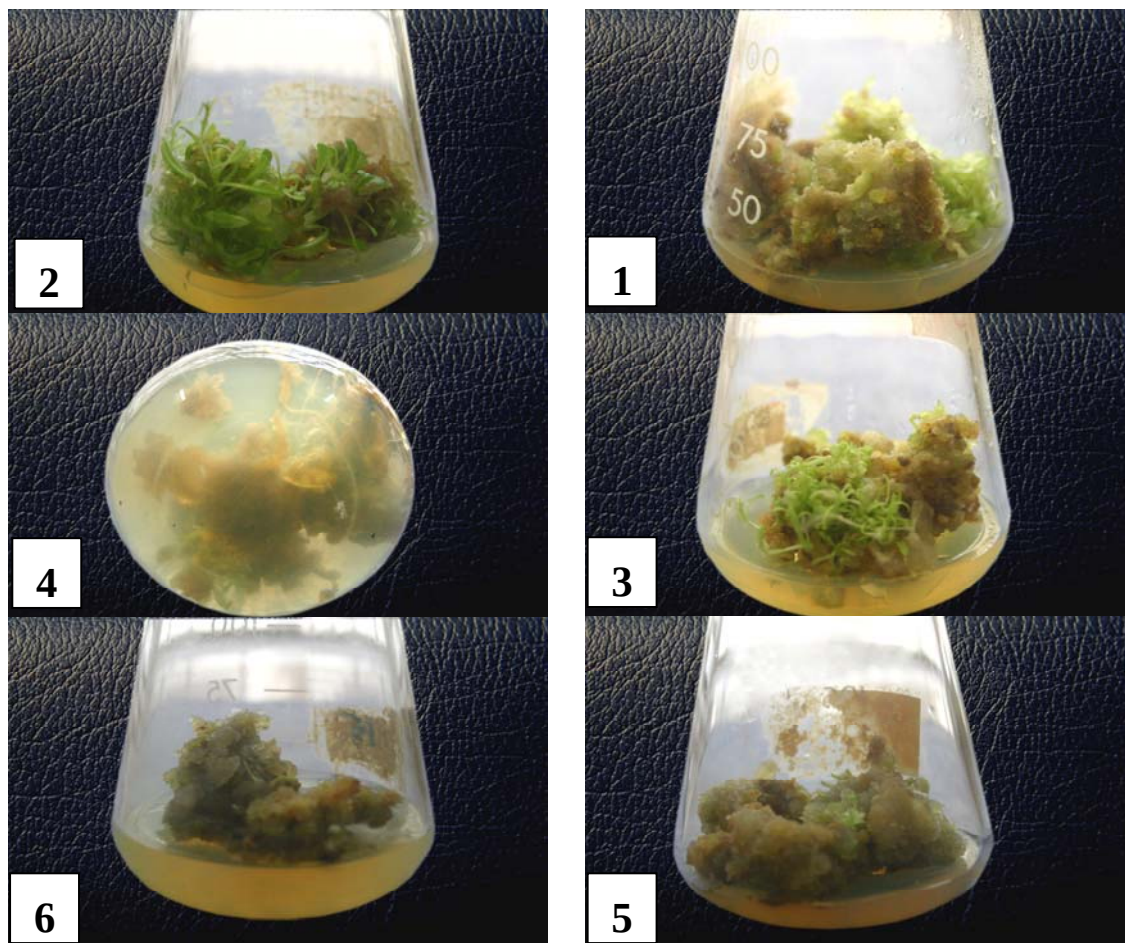
(5) _ (1) 17-1 _
I _

KNO₃ NH₄NO₃ / (0 248 0 0)

(NH₄⁺)

. (Palaniswamy et al. , 2002 ; Ahmed and Johnson , 2000)

(1998 ; Dodds and Roberts, 1985)



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-

[illegible]

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- .2001
- . *Lactuca sativa* L.
- .
- .2004
- . *Lactuca sativa* L.
- .
- PDA, Petadienoic) .1999
- (Acid
- .12-1 : (2) 10
- .() .2002
- .()
- .1988
- .2005
- . PDA 2,4-D (*Nigella sativa* L.)
- .
- .1977
- .
- .1990
- .
- .2000
- . *Lactuca sativa* L.
- .1998

REFERENCES

- Ahmed, A.K. and Johnson, K.A. 2000. The effect of the ammonium: nitrogen ratio, total nitrogen, salinity (NaCl) and calcium on the oxalate levels of tetragonia tetragonioides Pallas. Kunz. J. Hort. Sci. Biotechnol. 73: pp.533-538.
- Arezki, O.; Boxus, P.; Kevers, C. and Gaspar, T. 2000. Hormonal Control and Proliferation in meristematic agglomerates of *Eucalyptus camaldulensis* Dehn. In Vitro Cell. Dev. Biol. Plant. 36: pp.398-401.
- Arnon, D.I. and Hoagland, D.R. 1940. Crop production in artificial culture solution and in soil with special reference to factors influencing yield and absorption of inorganic untrients. Soil Sci. 50: 463p.
- Arnon, D.I. and Hoagland, D.R. 1944. The investigation of plant nutrition by artificial culture methods. Boil. Rev. 19: pp.55-67.
- Bellaloui, N. and Pilbeam, D.J. 1990. Reduction of nitrate in leaves of Tomato during vegetative growth. J. Plant Nutrition. 13 (1): pp.39-55.
- Bozzone, D.M. 1997. Using tissue culture to investigate plant cell differentiation and dedifferentiation. J. Biol. Education. 31 (4): pp.293-299.
- Campbell, T.B. ; Richings, E.W. ; Cripps, R.F. ; Taylor, N.J. and Cowan, A.K. 2000. The plant SnRK1 complex: Sugar sensing and cell metabolism in avocado fruit growth. South African J.Biot. 66: pp.104-118.
- Cardwell, K. F. and Okonkwo, S. N. C 1996. The effect of nitrogen on the growth and development of giant witchweed, *Striga hermonthica* Benth.: effect on cultured germinated seedlings in host absence. European J.Plant Pathology.102(1): pp.77-86.
- Collett, C.E.; Harberd, N.P. and Leyser, O. 2000. Hormonal interactions in control of *Arabidopsis* hypocotyls elongation. Plant Physiol. 124: pp.553-561.
- Dodds, J.H. and Roberts, I.W. 1985. Experiments in Plants Tissue Culture. Cambridge Univ. Press. London, New York.
- Hopkins , W.G. (1995). Introduction to Plant Physiology . John Wiley and Sons.Inc.New York.
- Lee, S.; Woffenden, B.J.; Beers, E.P. and Roberts, A.W. 2000. Expansion of cultural *Zinnia* mesophyll cells in response to hormones and light. Physiol. Plant. 108: pp.216-222.
- Linkohr, B.I.; Williamson, L.C.; Fitter, A.H. and Leyser, H.M.O. 2002. Nitrate and phosphate availability and distribution have different effects on root system architecture of *Arabidopsis*. Plant J. 29 (6): pp.751-760.
- Lowry, O.H.; Rosebrough, N.J.; Farr, A.J. and Randall, R.J. 1951. Protein measurement with folin phenol reagent. J. Biol. Chem. 193: pp.265-275.
- Mohammad, A.M.S. and Abood, S.A. 1989. Propagation of lettuce *Lactuca sativa* L.C.V. Longifloral by tissue Culture E. ESCWA.
- Mohammad, A.M.S. and Abood, S.A. 1995. Effect of some growth regulators on protein, nucleic acid and plant regeneration of *Sesamum indicum* L. callus. Raf. J. Sci. 6: pp.1-13.
- Murashige, T. and Skoog, F. 1962. A revised medium for rapid growth and bioassay with tobacco tissue culture. Physiol. Plant. 15: pp.473-479.

- Palaniswamy, U.R.; Bible, B.B. and McAvoy, R.J. 2002. Effect of nitrate: ammonium nitrogen ratio in oxalate levels of Purslane. Trends in new crops and new uses. J. Jainck and A. Whipkey (eds.). ASHS Press, Alexandria, VA. pp.453-455.
- Pierik, R.L.M. 1987. In Vitro Culture of Higher Plants. Martinus. Nijhoff Plub. Canada.
- Raven, P.H.; Fvert, R.F. and Eichhorn, S.E. 1986. Biology of Plants. 4th ed., Worth Publishers, Inc., New York, USA.
- Skoog, F. and Miller, C.O. 1957. Chemical regulation of growth and organ formation in plant tissue cultured in vitro. Symp. Soc. Exp. Biol. 11: 118-130.
- Street, H.E. 1977. Plant Tissue and Cell Culture. Blackwell Scientific Publication. Oxford. London. Edinburgh. Melbourne.
- Taiz, L. and Zeiger, E. 1998. Plant Physiology. 2nd _ed., Sinauer Associates, Inc. U.S.A.
- Vessey, J.K.; Henry, L.T.; Chaillou; S. and Raper, C.D. 1990. Root-zone acidity affect relative uptake of nitrate and ammonium from mixed nitrogen sources. J.