

(19) (KR)  
(12) (A)

(51) 。 Int. Cl.7  
C07C 225/22  
C07C 233/64  
C07C 311/21  
A61K 31/18

(11) 10-2004-0047798  
(43) 2004 06 05

(21) 10-2004-7002770  
(22) 2004 02 25  
2004 02 25  
(86) PCT/AU2002/001180 (87) WO 2003/018536  
(86) 2002 08 29 (87) 2003 03 06

(30) PR7383 2001 08 30 (AU)

(71) 3181 6

(72) 3178 6

3186 86

3788 9

(74)

:

(54)

1,2-







3 12 1

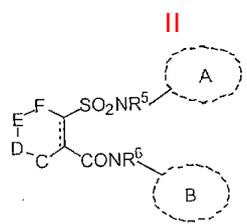
5 6 1 4

[b] [b] 1 2

1 가

가 5- 0 1 가 1 3 6- 0 2 5-, 6- 7- 가 1,2,3,4- 가 I 가

I 가 가 , 2- - ( ), 3- , p- 가 가 가 (N- ) N,N'- 가 / I 가 II 가 :

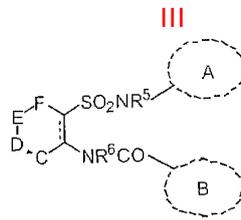


, A, B, C, D, E F

, R<sup>5</sup> R<sup>6</sup>

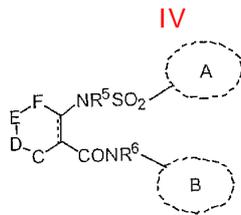
H,

, III 가 :



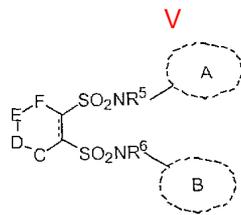
, A, B, C, D, E, F, R<sup>5</sup> R<sup>6</sup>

, IV 가 :



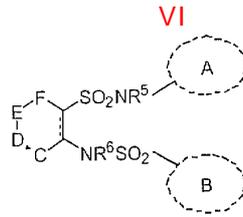
, A, B, C, D, E, F, R<sup>5</sup> R<sup>6</sup>

, V 가 :



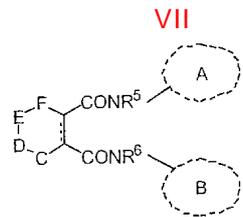
, A, B, C, D, E, F, R<sup>5</sup> R<sup>6</sup>

, VI 가 :



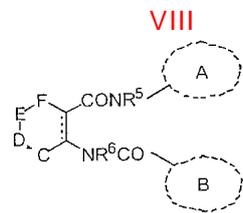
, A, B, C, D, E, F, R<sup>5</sup> R<sup>6</sup>

, VII 가 :



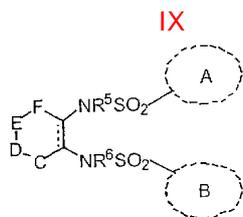
, A, B, C, D, E, F, R<sup>5</sup> R<sup>6</sup>

, VIII 가 :



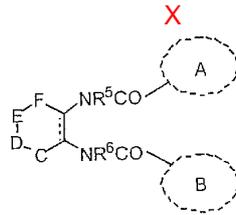
, A, B, C, D, E, F, R<sup>5</sup> R<sup>6</sup>

, IX 가 :



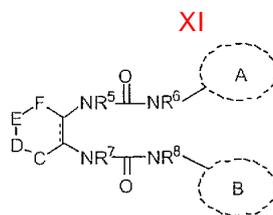
, A, B, C, D, E, F, R<sup>5</sup> R<sup>6</sup>

, X 가 :



, A, B, C, D, E, F, R<sup>5</sup> R<sup>6</sup>

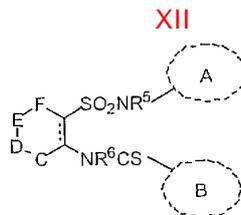
, XI 가 :



, A, B, C, D, E, F, R<sup>5</sup> R<sup>6</sup>

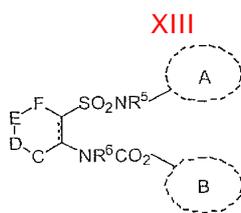
, R<sup>7</sup> R<sup>8</sup> H,

, XII 가 :



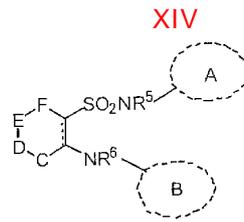
, A, B, C, D, E, F, R<sup>5</sup> R<sup>6</sup>

, XIII 가 :



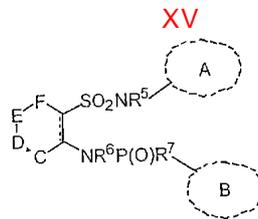
, A, B, C, D, E, F, R<sup>5</sup> R<sup>6</sup>

, XIV 가 :



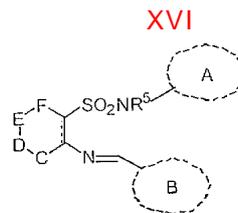
, A, B, C, D, E, F, R<sup>5</sup> R<sup>6</sup> .

, XV 가 :



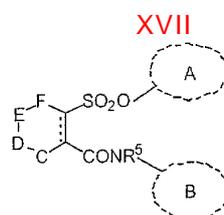
, A, B, C, D, E, F, R<sup>5</sup> R<sup>6</sup> , R<sup>7</sup> H, , , .

, XVI 가 :



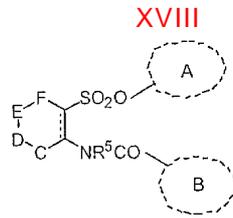
, A, B, C, D, E, F R<sup>5</sup> .

, XVII 가 :



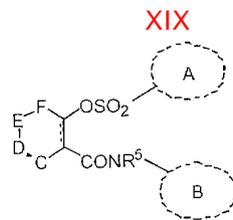
, A, B, C, D, E, F R<sup>5</sup> .

, XVIII 가 :



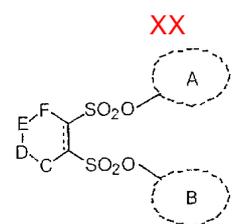
, A, B, C, D, E, F R<sup>5</sup> .

, XIX 가 :



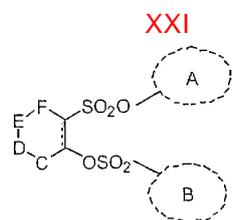
, A, B, C, D, E, F R<sup>5</sup> .

, XX 가 :



, A, B, C, D, E F .

, XXI 가 :







CONR 6 . , X가 SO<sub>2</sub> NR<sup>5</sup> Y가 NR<sup>6</sup> SO<sub>2</sub> I Y가

2- . X가 NR<sup>5</sup> SO<sub>2</sub> Y가 NR<sup>6</sup> SO<sub>2</sub> I 2- . X가 NR<sup>5</sup> CO Y가 NR<sup>6</sup> CO I . X가 SO<sub>2</sub> NR<sup>5</sup>

1,2- Y가 NR<sup>6</sup> I 2- . (J. F. Hartwig, et al. Journal of Organic Chemistry. 1999, 64 , 5575-5580 ). X가 SO<sub>2</sub> NR<sup>5</sup> Y가 NR<sup>6</sup> CS I Lawesson

5 Y가 NR<sup>6</sup> P(O)R<sup>7</sup> I . (B. Yde et al. Tetrahedron. 1984. 40 (11) , 2047-2052 ). X가 SO<sub>2</sub> NR<sup>5</sup>

ical Society. 1928. 92-99 ). X가 SO<sub>2</sub> O Y가 CONR<sup>5</sup> I J. D. Johnson. Journal of the Chem 1

2- . X가 SO<sub>2</sub> NR<sup>5</sup> Y가 N=CH I

2- X가 SO<sub>2</sub> O Y가 NR<sup>5</sup> CO I 4- . X가 SO<sub>2</sub> O Y가 SO<sub>2</sub> O I 11

X가 SO<sub>2</sub> O Y가 SO<sub>2</sub> O I 2- . X가 OS<sub>2</sub> Y가 CONR<sup>5</sup> I

. X가 Y가 OC(O) I . X가 CR=CR' Y가 C=N

I 2- . X가 N=N Y가 C(O)O I . (R. R. Holmes R. P. Bayer. Journal of the American Chemical Society. 1960. 82 . 3454 ).

. (J. March. Advanced ganic Chemistry. 4 . 638 ). . X Y가 N(->O)=N N=N(->O) I . X가 C=NO Y가 OC(O) I

Friedel-Crafts 2- . X가 SO<sub>2</sub> Y가 NRSO<sub>2</sub> X I

. X Y가 -ON=C I . X Y가 NRC(S)S I . X Y가 OS(O) . X

I Y가 P(O)(OR)NR' I . X Y가 NRP(O)(OR') I

I . X Y가 NRP(O)(OR')O I , 1,2- -2- . X Y가 OS(O)<sub>2</sub> NR I , 1,3- 2 I . X Y가 NRS(O)2NR' I

, N- N-( )- 가 . (D. L. Forster et al. Journal of the Chemical Society Section C. 1971. 993 ).

1

1N-(2,6- )-2-(2,6- )-

2- (1.8 g, 8.3 mmol) (10 mL) IR-120 ( ) -  
- 2- (1.6 g, 95%) .2- (1.2 g, 5.9 mmol) (20 mL) DMF(0.2 mL) 15  
가 . 2- (1.4 g, 98%)2,6- (1.66 mL, 8.8 mmol) (1.23 mL, 8.8 mmol) (25 mL) 2-  
(1.0 g, 4.2 mmol) 가 . 15N-(2,6- )-2-(2,6- )- (1.  
1 g, 48%) . <sup>1</sup>H NMR (200 MHz, CDCl<sub>3</sub>) 0.85 (d, J = 6.7 Hz, 6H), 0.92 (d, J = 6.9 Hz, 6H), 1.25  
(d, J = 6.6 Hz, 6H), 1.33 (d, J = 7.0 Hz, 6H), 3.05 (quin, J = 6.5 Hz, 2H), 3.38-3.72 (m, 2H), 6.79 (d, J = 7.8 Hz,  
1H), 7.04-7.6 (m, 6H), 7.36-7.60 (m, 4H), 8.42 (d, J = 7.9 Hz, 1H), 12.73 (br s, 1H) ; <sup>13</sup>C NMR (63 MHz,  
CDCl<sub>3</sub>) 21.9, 22.4, 24.7, 25.7, 28.3, 28.8, 121.5, 124.7, 125.3, 127.0, 128.9, 129.1, 129.1, 129.9, 131.4, 1  
33.0, 144.3, 146.4, 146.9, 163.7 ; MS (APCI-) m/z 519 (M-H); MS (APCI+) m/z 521 (M+H).2

N- -2-

2- (0.81 g, 3.4 mmol) (1.23 mL, 13.5 mmol) (30 mL)  
, 48 가 . /(40-60 )(1: 3) N- -2-  
(0.15 g, 13%) . <sup>1</sup>H NMR (200 MHz, CDCl<sub>3</sub>) 6.96-7.28 (m, 10H), 7.48-7.67 (m, 4H), 8.30  
(br s, 1H), 8.95 (br s, 1H) ; MS (APCI-) m/z 351 (M-H); MS (APCI+) m/z 353 (M-H).3

N-[2-(4- )- ]-

4- (1.0 g, 8.12 mmol) (100 mL) (1.3 mL, 9.33 mmol) 2-  
(1.98 g, 8.93 mmol) 가 . rt 16  
(100 mL) , (MgSO<sub>4</sub>), N-(4-  
)-2- (2.45 g, 98%) .(20 mL) (0.2 mL) N-(4- )-2- (0.21 g, 0.66 mmol) (2  
0mg) 10% rt 18  
(0.18 g, 97%) . 2- -N-(4- )(2 mL) (40 μL, 0.45 mmol) (58 mg, 0.45 mmol)  
( ) (0.1 mL) 가 . 40  
(2 mL) 2- -N-(4- ) (84 mg, 0.30 mmol) 가  
18 . N-[2-(4-  
)- ]- (0.10 g, 86%) . <sup>1</sup>H NMR (200 MHz, d<sub>6</sub>-DMSO) 3.58 (s, 3  
H), 6.65 (d, J = 9.0 Hz, 2H), 6.85 (d, J = 9.0 Hz, 2H), 7.27-7.36 (m, 1H), 7.63-7.75 (m, 4H), 8.27 (br d, J = 8.  
2 Hz, 1H), 8.81-8.85 (m, 2H), 10.07 (br s, 1H), 10.14 (br s, 1H); <sup>13</sup>C NMR (50.3 MHz, d<sub>6</sub>-DMSO) 55.0,  
114.3, 120.9, 123.3, 124.7, 125.5, 128.3, 128.5, 129.2, 133.9, 135.3, 140.7, 150.5, 157.3, 162.9; MS (APCI-)  
m/z 382 (M-H); MS (APCI+) m/z 384 (M-H).4

N-[2-(4- )- ]-4-

(2 mL) (40  $\mu$ L, 0.45 mmol) 4- (74 mg, 0.44 mmol) ( )  
 (2 mL) 2- -N-(4- ) (0.1 mL) 가 40 (82 mg, 0.30 mmol, 3 )  
 N-[2-(4- )- ]-4- (0.72 g, 57%) .  $^1$ H NMR (200 MHz,  $d_4$ -MeOD) 3.70 (s, 3H), 6.72-6.80 (m, 2H), 6.95-7.14 (m, 4H), 7.37-7.49 (m, 1H), 7.52-7.59 (m, 1H), 8.20-8.26 (m, 3H), 8.28-8.34 (m, 3H); MS (APCI-) m/z 426 (M-H).

5

N-[2-(4- )- ]-4-

(5 mL) (95  $\mu$ L, 1.08 mmol) 4- (150 mg, 1.08 mmol)  
 ( ) (0.15 mL) 가 40  
 (5 mL) (0.15 mL, 1.08 mmol) 2- -N-(4- ) (0  
 .2 g, 0.72 mmol, 3 ) 가 18 3  
 (MgSO<sub>4</sub>),  
 ( 2% ) N-[2-(4- )  
 - ]-4- - (0.19 g, 65%) .  $^1$ H NMR (200 MHz,  $d_4$ -MeOD) 3.75 (s, 3H), 6.70-6.75 (m, 1H), 6.85-6.90 (m, 2H), 6.95-7.05 (m, 1H), 7.18-7.25 (m, 1H), 7.50 (d, J = 10.0 Hz, 2H), 7.85-7.90 (m, 1H), 8.45 (d, J = 8.0 Hz, 2H), 9.00 (d, J = 8.0 Hz, 2H);  $^{13}$ C NMR (50.3 MHz,  $d_6$ -DMSO) 5 5.0, 114.3, 115.5, 115.9, 122.6, 124.0, 125.5, 127.5, 128.6, 129.1, 129.8, 130.0, 130.3, 133.9, 135.9, 157.3, 161.9, 163.3, 166.8; MS (APCI-) m/z 399 (M-H).

6

N,N'-(2,6- )-

(1.8 mL, 12.9 mmol) 2,6- (90%, 2.7 mL, 12.9 mmol) (20 mL)  
 (50 mL) 가 (1.24 g, 6.1 mmol) 가 15  
 (50 mL) / (40-60 )(1: 9)  
 N,N'-(2,6- )- (0.09 g, 3%) .  $^1$ H NMR (200 MHz, CDCl<sub>3</sub>) 1.22 (d, J = 6.8 Hz, 24H), 3.27 (quin, J = 6.9 Hz, 4H), 7.15-7.38 (m, 6H), 7.60-7.65 (m, 2H), 7.93-7.99 (m, 2H), 8.16 (br s, 2H);  $^{13}$ C NMR (50 MHz, CDCl<sub>3</sub>) 23.7, 28.7, 123.4, 128.4, 129.3, 130.9, 131.0, 135.8, 146.2, 168.1 ; MS (APCI-) m/z 483 (M-H).

7

1-m- -3-[4-(3-m- - )]- -3- ]-

30 (5 mL) 3,4- (0.5 g, 4.58 mmol) m-  
 (0.6 mL, 4.7 mmol) 가 4 가  
 ( 10% ) 1-m- -3-[4-(3-m- - )  
 - -3- ]- (0.18 g, 10%) .  $^1$ H NMR (200 MHz,  $d_4$ -MeOD/CDCl<sub>3</sub>) 2.20 (s, 3H), 2.23 (s, 3H), 6.70-6.81 (m, 2H), 7.04-7.18 (m, 6H), 7.98 (d, J = 6.0 Hz, 1H), 8.12 (d, J = 6.0 Hz, 1H), 8.18 (br s, 1H);  $^{13}$ C NMR (50.3 MHz,  $d_6$ -DMSO) 122.6, 123.1, 123.4, 128.5, 128.7, 137.8, 138.0, 139.0, 139.6, 142.1, 146.8, 148.1, 151.9, 153.7; MS (APCI+) m/z 376 (M+H).

8

2-(4- )-N- -4- -

N,N- (100 mL) (2.0 g, 14.6 mmol), (4.6 g, 22.3 mmol)  
 ), 4- (10 mg) 4- (1.65 g, 17.5 mmol) 16  
 (

5% ) ( ) 2- -N- -4-  
 (0.24 g, 8 %) .  
 (3 mL) (0.27 g, 1.3 mmol) (5 mL) 2- -N-  
 -4- (0.25 g, 1.2 mmol) (0.2 mL, 1.4 mmol) 가  
 18 3 (MgSO<sub>4</sub>), 2-(4- -  
 ) -N- -4- - (45 mg, 10%) . <sup>1</sup>H NMR (200 MHz, C  
 DCI<sub>3</sub>) 3.60 (s, 3H), 6.66-6.72 (m, 2H), 7.13-7.24 (m, 2H), 7.44-7.54 (m, 1H), 7.57-7.77 (m, 5H), 8.09 (d  
 d, J = 8.0, 1.5 Hz, 1H), 8.74 (dd, J = 8.5, 1.0 Hz, 1H), 10.32 (br s, 1H), 11.72 (br s, 1H).

9

2-(4- )-N- -4-  
 p- (0.5 g, 3.3 mmol) (6 mL, 82.3 mmol) 16  
 가 4-  
 N-(2- ) (0.1 g, 0.46 mmol, 8 )  
 (8 mL) (100 μL, 0.68 mmol) 16 가 3  
 5% (MgSO<sub>4</sub>) ,  
 ( ) 2-(4- - )-N- -4-  
 (45 mg, 30%) . <sup>1</sup>H NMR (200 MHz, d<sub>4</sub>-MeOD) 3.76 (s, 3H), 6.81-6.89 (m,  
 2H), 7.42-7.59 (m, 5H), 7.76-7.87 (m, 1H); MS (APCI+) m/z 348 (M+H).

10

[2-(4- )- ]- tert-  
 N-t- (0.2 g, 0.92 mmol) THF(8 mL) 2- -N-(4- ) (0.21  
 g, 0.75 mmol, 가 3 ), (0.3 mL, 2.15 mmol) N,N- (10  
 mg) 0.5 M rt 18 2 ,  
 (MgSO<sub>4</sub>) .  
 ( ) [2-(4- )- ]- tert  
 - (0.2 g, 81%) . <sup>1</sup>H NMR (200 MHz, CDCl<sub>3</sub>) 1.34 (s, 9H), 3.83 (s, 3H  
 ), 4.76 (br s, 1H), 6.70-6.82 (m, 2H), 6.86-6.94 (m, 2H), 7.22-7.39 (m, 3H), 7.75 (dd, J = 8.0, 1.6 Hz, 1H) ;  
 MS (APCI+) m/z 379 (M+H).

11

-1,2- 1-[(4- )- ] 2- -4-  
 4- (0.17 g, 1.8 mmol) (0.25 mL, 1.8 mmol) (10 mL) -1,2-  
 (0.5 g, 1.8 mmol) 가 3 (0.2  
 2 g, 1.8 mmol) (0.25 mL, 1.8 mmol) 가 15 .  
 ( 12 ), -1,2- 1-[(4- )  
 10% ] 2- -4- (0.07 g, 9%) , 2-(  
 4- )- [1,3,2]- 1,1,3,3- . <sup>1</sup>H NMR (200 MHz, d<sub>6</sub>-DMSO) 3.66 (s,  
 3H), 6.80 (d, J = 8.7 Hz, 2H), 6.99 (d, J = 7.4 Hz, 2H), 7.02 (d, J = 8.7 Hz, 2H), 7.56-7.87 (m, 3H), 8.06 (d, J =  
 7.4 Hz, 2H), 8.17 (d, J = 6.6 Hz, 1H), 9.30 (br s, 1H) ; MS (APCI+) m/z 420 (M+H); MS (APCI-) m/z 418(M-  
 H).

12



mL) (2x15 mL) (MgSO<sub>4</sub>).  
 2-(4- )- ]-N- -4- - (0.08 g  
 , 55%) .

<sup>1</sup>H NMR (200 MHz, d<sub>6</sub>-DMSO) 3.70 (s, 3H), 6.82 (d, J = 6 Hz, 2H), 7.06 (d, J = 6 Hz, 2H), 7.70 (br m, 6H), 8.51 (d, J = 5 Hz, 2H), 9.49 (br s, 1H), 10.98 (br s, 1H); MS (APCI+) m/z 384 (M+H); MS (APCI-) m/z 382 (M-H).

17

4- -N-[2-(3,4,5- )- ]-

3,4,5- (3.76 g, 20.5 mmol) (250 mL) 2- ( )  
 5.01 g, 22.6 mmol) (2.38 g, 23.6 mmol) 가 . 16  
 H<sub>2</sub>O(3x300 mL) , (MgSO<sub>4</sub>) 3,4,5-  
 -2- (5.81 g, 69%) .

3,4,5- -2- (5.81 g, 15.7 mmol) (200 mL) .  
 10% (0.6g, 0.6 mmol Pd) (1 mL) 가 , 48  
 (GF/A) 3,4,5-  
 2- / (4.64g, 87 %) .

0 , N,N- (50 μL) (4 mL) 4- (124 m  
 g, 0.89 mmol) (77 μL, 0.87 mmol) 가 . 45  
 3,4,5- -2- (200 mg, 0.59 mmol) (125  
 μL, 0.89 mmol) (3 mL) 가 .  
 16  
 (MgSO<sub>4</sub>) , NaHCO<sub>3</sub> (2x10 mL) (3x10 mL) .  
 (137 mg, 50%) 4- -N-[2-(3,4,5- )- ]-

<sup>1</sup>H NMR (200 MHz, CDCl<sub>3</sub>) 3.60 (s, 6H), 3.68 (s, 3H), 6.16 (s, 4H), 7.05-7.24 (m, 4H), 7.62 (t, J = 7 Hz, 1H), 7.78-7.92 (m, 3H), 8.51 (d, J = 7 Hz, 1H), 9.92 (s, 1H); MS (APCI+) m/z 483 (M+Na); MS (APCI-) m/z 459 (M-H).

18

1H- -2- [2-(3,4,5- )- ]-

0 , N,N- (50 μL) (4 mL) -2- (99 mg,  
 0.87 mmol) (77 μL, 0.87 mmol) 가 . 45  
 3,4,5- -2- ( ( 17 ) (203 mg, 0.60 m  
 mol) (125 μL, 0.89 mmol) (3 mL) 가 .  
 16  
 (MgSO<sub>4</sub>), NaHCO<sub>3</sub> (2x10 mL) (3x10 mL)  
 -2- [2-(3,4,5- )- ]- (183 mg, 71%) .

<sup>1</sup>H NMR (200 MHz, CDCl<sub>3</sub>) 3.40 (s, 6H), 3.60 (s, 3H), 6.15 (s, 1H), 6.29 (m, 1H); 6.75 (m, 1H), 7.00 (m, 1H), 7.14 (t, J = 7 Hz, 1H), 7.55 (t, J = 7 Hz, 1H), 7.81 (d, J = 7 Hz, 1H), 8.41 (d, J = 7 Hz, 1H), 9.35 (s, 1H), 9.68 (s, 1H); MS (APCI+) m/z 454 (M+Na); MS (APCI-) m/z 430 (M-H).

19

N-[2-(3,4,5- )- ]-

0 , N,N- (50 μL) (4 mL) (110 mg, 0.8  
 9 mmol) (77pL, 0.87 mmol) 가 . 45

3,4,5- (125 μL, 0.89 mmol) (3 mL) (201 mg, 0.60 mmol) 가  
 16  
 (MgSO<sub>4</sub>), NaHCO<sub>3</sub> (2x10 mL) (3x10 mL)  
 N-[2-(3,4,5- )- ]- / (92 mg, 35%)

<sup>1</sup>H NMR (200 MHz, d<sub>6</sub>-DMSO) 3.36 (s, 6H), 3.55 (s, 3H), 6.21 (s, 2H), 7.41 (m, 1H), 7.65-7.82 (m, 3H), 7.89 (d, J = 6 Hz, 1H), 8.28 (d, J = 6 Hz, 1H), 8.85 (d, J = 6 Hz, 2H), 10.18 (d, J = 6 Hz, 1H); MS (APCI+) m/z 444(M+H).

20

Nicosia Ottinetti (Nicosia, R. F. et al. Lab. Investigation 63: 115, 1990; Nicosia, R. F. et al. Cell. Dev. Biol. 26: 119-128, 1990)

가 1.5% 9 cm  
 , 10 17 mm 가 가  
 6- 3  
 MEM 0.22 μm HEPES L- 가 p  
 IO mM 1 mM 800 mL (50 mg/L)  
 H 7.4 2.5 mg/L B) 200 mL FCS (20% ) 0.2 μ 1  
 3-4  
 , 0.5 mm  
 MEM 12  
 가 150 μL  
 MEM 3 mg/mL 가 50 U/mL  
 (1 mL) (20 μL) 30  
 6- 가 /  
 150 μL 2 가  
 mL 3 - 4, 20 100 μg/mL DMSO 6 mg/  
 가 가  
 6 mL MEM 3 가 MEM 가  
 37 CO<sub>2</sub> 14  
 가 가 , 5  
 가 가 Liekens et al. (Liekens, S., et al. Oncol. Res. 9: 173-181, 1997) 0 10

실시예	농도 ( $\mu\text{g/mL}$ )	성장 억제%(일)	성장 억제%(일)
1	50 20 4	100 (7) 98 (7) 100 (7)	100 (14) 98 (14) 100 (14)
2	50 20 4	70 (5) 90 (5) 50 (5)	
3	10 4 1 0.5	100 (5) 100 (5) 100 (5) 100 (5)	100 (12) 100 (12) 100 (12) 60 (12)
5	10	80 (5)	70 (12)
6	10	10 (7)	
8	10	80 (5)	30 (12)
12	10		20 (12)
13	10 4 1 0.5	100 (7) 100 (7) 100 (7) 90 (7)	100 (12) 100 (12) 100 (12) 90 (12)
15	4	90 (7)	
16	10	70 (7)	10 (12)

21

HeLa ( ) 72 ( 100  $\mu\text{M}$  WST-1  
 ). 450 nm ( , 0.05% NP-4  
 0 (100% )  
 DMSO ( ) : (%) = 100x(I-OD  
 /OD ). (%)

(100 $\mu\text{M}$ )	(%)
	0
1	94
3	92
4	56
5	91
8	84
- DMSO	- 19
-	13

22

HUVEC ( $1.5 \times 10^3$ ) 100  $\mu$ L EBM-2 (Clonetic # CC3162) 96-  
 (100  $\mu$ L) EBM-2 2 (5-7 ) 가 .24 (0 ) ,  
 10 20% 0.5% .72 , 20% 0.5%  
 72 37 .72 , 20% 0.5%  
 ), ELISA (Dynatech Laboratories) :0.1M 1:1 (0  
 540 nm .72 0  
 ) IC<sub>50</sub> (50%

	IC <sub>50</sub>
1	2.4 ± 0.5 $\mu$ M
3	0.29 ± 0.22 $\mu$ M
5	7.1 ± 2.7 $\mu$ M
12	> 75 $\mu$ M
13	0.28 ± 0.22 $\mu$ M

23

(60  $\mu$ L 10 mg/mL) - 96- 15  
 37 30 HUVEC EGM-2 (Clonetic # CC31  
 62)  $2 \times 10^5$  /mL (5 )  
 (500  $\mu$ L) and 2x (500  $\mu$ L) 200  $\mu$ L  
 .24 , Bioquant Image Analysis (IC<sub>50</sub>) 가 .

	IC <sub>50</sub>
3	0.48 ± 0.27 $\mu$ M
5	36.1 ± 9.4 $\mu$ M
12	> 50 $\mu$ M
13	0.41 ± 0.03 $\mu$ M

24

48- Boyden 8  $\mu$ m - (10  $\mu$ g/mL ; Collaborative Laboratorie  
 s) (Osmonics, Inc.) (bFGF, VEGF or Swiss 3T3 27-29  $\mu$ L DMEM  
 ( ) - )  
 $10^6$  /mL .37 5 , PBS 45  $\mu$ L HUVEC (1  
 , Diff-Quick Kimwip





5.  
1 , X SO<sub>2</sub> NR<sup>5</sup> , Y SO<sub>2</sub> NR<sup>6</sup> , R<sup>5</sup> R<sup>6</sup> 2  
|
6.  
1 , X SO<sub>2</sub> NR<sup>5</sup> , Y NR<sup>6</sup> SO<sub>2</sub> , R<sup>5</sup> R<sup>6</sup> 2  
|
7.  
1 , X CONR<sup>5</sup> , Y CONR<sup>6</sup> , R<sup>5</sup> R<sup>6</sup> 2 |
8.  
1 , X CONR<sup>5</sup> , Y NR<sup>6</sup> CO , R<sup>5</sup> R<sup>6</sup> 2 |
9.  
1 , X NR<sup>5</sup> SO<sub>2</sub> , Y NR<sup>6</sup> SO<sub>2</sub> , R<sup>5</sup> R<sup>6</sup> 2  
|
10.  
1 , X NR<sup>5</sup> CO , Y NR<sup>6</sup> CO , R<sup>5</sup> R<sup>6</sup> 2 |
11.  
1 , X NR<sup>5</sup> CONR<sup>6</sup> , Y NR<sup>7</sup> CONR<sup>8</sup> , R<sup>5</sup> R<sup>6</sup> 2 , R  
7 R<sup>8</sup> H, |
12.  
1 , X SO<sub>2</sub> NR<sup>5</sup> , Y NR<sup>6</sup> CS , R<sup>5</sup> R<sup>6</sup> 2 |
13.  
1 , X SO<sub>2</sub> NR<sup>5</sup> , Y NR<sup>6</sup> CO<sub>2</sub> , R<sup>5</sup> R<sup>6</sup> 2  
|
14.  
1 , X SO<sub>2</sub> NR<sup>5</sup> , Y NR<sup>6</sup> , R<sup>5</sup> R<sup>6</sup> 2 |
15.  
1 , X SO<sub>2</sub> NR<sup>5</sup> , Y NR<sup>6</sup> P(O)R<sup>7</sup> , R<sup>5</sup> R<sup>6</sup> 2 , R<sup>7</sup>  
H, , |
16.  
1 , X SO<sub>2</sub> NR<sup>5</sup> , Y N=CH , R<sup>5</sup> 2 |
17.  
1 , X SO<sub>2</sub> O , Y CONR<sup>5</sup> , R<sup>5</sup> 2 |
18.  
1 , X SO<sub>2</sub> O , Y NR<sup>5</sup> CO , R<sup>5</sup> 2 |
19.  
1 , X OSO<sub>2</sub> , Y CONR<sup>5</sup> , R<sup>5</sup> 2 |



29      **31.**      30      ,

29      **32.**      31      ,

**33.**  
1      27      /      가      .