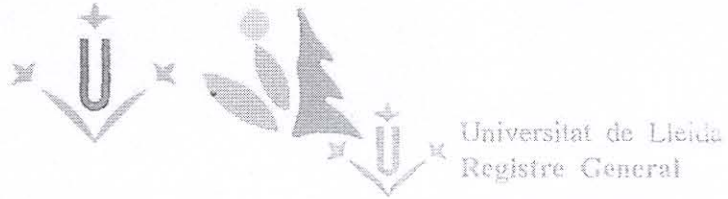


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TESI DOCTORAL



TECNOLOGIA POSTCOLLITA DE L'AVELLANA.

ASSECATGE I FRIGOCONSERVACIÓ DE L'AVELLANA
(*Corylus avellana* L.)

Maria Teresa Piqué Ferré
Juny 1995

010-43360

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6. ANEX

PROGRAMA DE SIMULACIÓ

(Assecat en llit profund d'avellana *Negret* en closca)

Const cv = 1.86
 Const ro = 2500.6
 Const ca = 1.004
 Const cw = 4.19
 Const tmo = 15
 Const hmos = .2062
 Const hmo = hmos / (1 + hmos) 'humitat inicial avellana
 Const alt = 3.8 'altura llit d'avellana en m
 Const dx = .01 'espesor capa
 Const n1 = 380 ' numero de capes
 Const dt = 1 'min
 Const dmo = 426 'densitat avellana seca inicial
 Const scaja = 4.15 'superf. sitja
 Const COTEX = 0
 'Condicions inicials
 Dim hmi As Single
 Dim tmi As Single
 Dim tai As Single
 Dim wai As Single
 Dim hrair As Single
 'Condicions finals
 Dim HMSAL As Single
 Dim tasal As Single
 Dim wasal As Single
 Dim tmsal As Single
 Dim hrsal As Single

 Dim eqh As Single
 Dim dhm As Single
 Dim hmmed As Single
 Dim wmed As Single
 Dim tex As Single
 Dim wex As Single
 Dim dz As Single
 Dim ma As Single
 Dim vo As Single
 Dim pair As Single
 Dim tinf As Single
 Dim z As Integer
 Dim hp As Integer
 Dim tsec As Integer
 Global n As Integer

 'Propietats de l'avellana
 Dim cm As Single
 Dim lag As Single
 Dim lavell As Single



Dim dm As Single

Dim h As Single

Global ficgrab As String

Global inicio, final As Integer

Global finsim As Integer

Global simula() As Single

Global temps As Integer

'Simulassecat

Sub simulassecat ()

Dim b As Integer

Dim hrex As Single

Dim s As Single

Dim grab As String

Static hm(7, 381) As Single

Static tm(7, 381) As Single

Static ta(7, 381) As Single

Static wa(7, 381) As Single

Static hra(7, 381) As Single

ficgrab = "c:\tbl\ne35.sec"

'Open ficgrab For Append As #1

'Print #1, camara

'Close #1

For z = 1 To n1

 hm(0, z) = hmos: tm(0, z) = tmo

Next z

dm = dmo: dz = dx

final = 120

ReDim simula(final + 1, 10)

If temps = 0 Then

 finsim = final

Else

 finsim = 10 * Val(modelo.text(0).Text)

End If

For n = 1 To finsim

 'Condicions aire

 tex = 15: hrex = .01 * 75

 tinf = 36

 psatex = presiosatura(tex)

 pair = 1.013

 wex = .622 * hrex * psatex / (pair - hrex * psatex)

 ma = 42.27'kg/min/m2

 For hp = 1 To 6

 tsec = (n - 1) * 6 + hp

 ta(hp, 0) = tinf: wa(hp, 0) = wex

 For z = 1 To n1

 tai = ta(hp, z - 1): tmi = tm(hp - 1, z)

```

wai = wa(hp, z - 1): hmi = hm(hp - 1, z)
pws = presiosatura(tai)
hrrair = pair * wai / (pws * (wai + .622))
If z = 1 Then hra(hp, 0) = hrrair
humequi
page
hmmed = (hmi + HMSAL) / 2
cm = 1.65
d = .016
h = ((6/d)*.204 * (ma*60) ^ .8)* 60 / 1000 ' kj/minm3k
lag = 2500.6 - 2.3643956 * 22
lavell = lag * (1 + .5904 * Exp(-.1367 * 100 * hmmed))
dwa = -dm * dz * dhm / (ma * dt)
wasal = wai + dwa
wmed = (wasal + wai) / 2
tempnellist
pws = presiosatura(tasal)
hrsalsal = pair * wasal / (pws * (wasal + .622))

If hrsalsal > .85 Then
  rehumectacio
  hm(hp, z) = hrsalsal: tm(hp, z) = TMSAL
  ta(hp, z) = tasal: wa(hp, z) = wasal
  hra(hp, z) = hrsalsal
  For b = z To n1
    hm(hp, b) = hm(hp - 1, b)
    tm(hp, b) = tm(hp - 1, b)
    wa(hp, b) = wasal: hra(hp, b) = hrsalsal
    ta(hp, b) = tasal
  Next b
  z = n1
Else
  hm(hp, z) = HMSAL: tm(hp, z) = tmsal
  ta(hp, z) = tasal: wa(hp, z) = wasal
  hra(hp, z) = hrsalsal
End If
Next z

avella = 0
For b = 1 To n1
  avella = avella + hm(hp,b)
Next b
avella1 = avella / n1:
's = .10
dz = dx
dm = dmo
Next hp

For b = 1 To n1
  hm(0, b) = hm(6, b): tm(0, b) = tm(6, b)
Next b
simula(n, 0) = hm(6, 40): simula(n, 1) = hm(6, 80)
simula(n, 2) = hm(6, 120): simula(n, 3) = hm(6, 160)
simula(n, 4) = hm(6, 200): simula(n, 5) = avella1
simula(n, 6) = tasal: simula(n, 7) = 100 * hrsalsal

```

```

'grabació
'humitat avellana puntual
grab = Format$(n / 10, "00.0") + Chr$(32)
grab = grab + Format$(hm(6, 1), "0.000000") + Chr$(32)
For z = 1 To n1 Step n1 / 10
    grab = grab + Format$(hm(6, z), "0.000000") + Chr$(32)
Next z
grab = grab + Format$(avella1, "0.000000") + Chr$(32)
Open "c:\tb\hmne35.xls" For Append As #1 'grabar en disco
Print #1, grab
Close #1
'humitat absoluta aire
grab = Format$(n / 10, "00.0") + Chr$(32)
For z = 0 To n1 Step n1 / 10
    grab = grab + Format$(wa(6, z), "0.000000") + Chr$(32)
Next z
Open "c:\tb\wane35.xls" For Append As #1 'grabar en disco
Print #1, grab
Close #1
'humitat relativa aire
grab = Format$(n / 10, "00.0") + Chr$(32)
For z = 0 To n1 Step n1 / 10
    grab = grab + Format$(100 * hra(6, z), "00.000") + Chr$(32)
Next z
Open "c:\tb\hrane35.xls" For Append As #1 'grabar en disco
Print #1, grab
Close #1
'temperatura aire
grab = Format$(n / 10, "00.0") + Chr$(32)
For z = 0 To n1 Step n1 / 10
    grab = grab + Format$(ta(6, z), "00.000") + Chr$(32)
Next z
Open "c:\tb\tane35.xls" For Append As #1 'grabar en disco
Print #1, grab
Close #1
'temperatura avellana
grab = Format$(n / 10, "00.0") + Chr$(32)
grab = grab + Format$(tm(6, 1), "00.000") + Chr$(32)
For z = 1 To n1 Step n1 / 10
    grab = grab + Format$(tm(6, z), "00.000") + Chr$(32)
Next z
Open "c:\tb\tmne35.xls" For Append As #1 'grabar en disco
Print #1, grab
Close #1
'humitat avellana mitja per capes
grab = Format$(n / 10, "00.0") + Chr$(32)
For z = 1 To 10
    avella = 0
    For a = 1 To n1 / 10
        avella = avella + hm(6, a + (z - 1) * n1 / 10)
    Next a
    avella = avella / (n1 / 10)
    grab = grab + Format$(avella, "0.000000") + Chr$(32)
Next z

```

```

grab = grab + Format$(avella1, "0.000000") + Chr$(32)
Open "c:\tb\hmedne35.xls" For Append As #1 'grabar en disco
Print #1, grab
Close #1

```

```
Next n
```

```
End Sub
```

```
Function presiosatura (ta As Single)
```

```

If ta <= 60 Then
    pws = (Exp(14.293 - 5291 / (ta + 273.15))) / (3.2917 - .01527 * (ta + 273.15) + (.0000254) * (ta +
273.15) ^ 2)
Else
    pws = Exp(13.5921 - 5064.72 / (ta + 273.15))
End If
presiosatura = pws

```

```
End Function
```

```
Sub humequi ()
```

```

Dim eqhw As Single
Dim eq1 As Single
Dim eq2 As Single
eqh = .045 * 8.10 * .819 * hrair / ((1 - .819 * hrair) * (1 + (8.10 - 1) * .819 * hrair))

```

```
End Sub
```

```
Sub page ()
```

```

Dim teq As Single
Dim k As Single
Dim u As Single
k = 2.94 * Exp(-1598 / (273.15 + tai))
u = .5314 - .0014* tai - .0001* hrair
If hmi < eqh Then teq = 12000
If hmi > eqh Then
    If hmos > hmi Then
        teq = (-Log((hmi - eqh) / (hmos - eqh))) / k ^ (1 / u)
    Else
        teq = 0
    End If
End If
dhm = -(hmi - eqh) * k * u * (teq + dt*60) ^ (u - 1)
HMSAL = hmi + dhm

```

```
End Sub
```

Sub rehumectacio ()

```

Dim agreh As Single
Dim ws As Single
Dim hms1 As Single
ws = wasal - .00004
Do
  wmed = (ws + wai) / 2
  agreh = ma * dt * (wasal - ws)
  hms1 = HMSAL + (agreh / (dm * dz))
  dhm = (hms1 - hmi) / dt
  tempnellist
  pws = presiosatura(tasal)
  hrsal = pair * ws / (pws * (ws + .622))
  ws = ws - .00004
Loop Until hrsal < .94
wasal = ws + .00004
HMSAL = hms1

```

End Sub

Sub tempnellist ()

```

Dim a1, b1 As Single
Dim a, b As Single
Dim e, f, y As Single
Dim tamed As Single
Dim tmmed As Single
Dim tmsal1 As Single
Dim tmsal2 As Single
tamed = (tai + tmi) / 2
tmmed = tmmed
a1 = -dm * dz * (tamed - tmi) * (ca + cw * (HMSAL))
b1 = dm * dz * dhm * (cv * tai + lag - cw * tmi)
tasal = tai + (a1 + b1) / (ma * dt) / (ca + cv * (wmed - dm * dz * dhm / ma / dt))
a = 2 * (tai - tmi)
b = cm + cw * hmmed
y = lavell + cv * tamed - cw * tmmed
e = ca + cv * (wmed - dm * dz * dhm / ma / dt)
f = cv * ta + lag - cw * tmi
tmsal1 = a + dm * dhm / dt * (2 * y / h + dz * f / ma / e)
tmsal2 = 1 + dm / dt * (2 * b / h + dz / ma / e * (b + cw * dhm))
tmsal = tmi + tmsal1 / tmsal2
If tmsal > tasal Then tmsal = tasal
If tmsal < tmo Then tmsal = tmo

```

End Sub