Hkkjrh; df"k vuqla/kku if=dk] 30(3)] 155&158] 2015

mipkjk d iHkko d lgh vkdyu gr
mPp Øe ucj lUrfyr pØh; Cykd vfHkdYiuk,

vi.k Hkkfed] ,Ynks oxhl] lhek tXxh] fluh oxhl] ch- t- xgykr ,o fot; fcUny

Hkk-d-v-i-& Hkkjrh; df"k lkf[;dh vuqla/kku lLFkku Ykkbcjh ,oU;] ub fnYyh&110012

ikIr % tykbZ] 2015 Lohdr % flrEcj] 2015

Lkkjk"k

— df"k] unkfud] ckxokuh ,o —df"k okfudh d ijh{k.kksa e fudVorh bdkbZ;ksa d ucj iHkkoksa dk ik;k tkuk cMh lkoZkj.k ckr gA fudVorh ijh{k.kksaRed bdkbZ;ksa e ucj iHkkoksa d vufpr ic/ku d dkj.k ijh{k.kksa d fu"d"kksZa gn rd iHkkoh gkrs gA vr% tgk fudVorh bdkbZ;ksa d ucj iHkko ekurs gSa ogk ijh{k.k dh ifj'kq)rk c<ku d fy,] ekMy e ucj iHkkoksa dk lek;kftr dju dh lykg nh tkrh gA ;gk lehiorh bdkbZ;ksa d lHkh fn'kkvksa e ik; tkus oky lfn'k ucj iHkkoksa oky ,d ekMy ij fopkj fd;k x;k gA bl vfrfjDr] k-1 (tgk k Cykd vkdkj g) njh rd lHkh fn'kkvksa e fLFkr lehiorh bdkbZ;ksa d lfn'k ucj iHkkoksa d fy, lUrfyr i.kr;k pØh; Cykd vfHkdYiuk dh ,d J.kh ikIr dh x;h gA bl idkj l ikIr vfHkdYiuk, mipkj d iR;{k ,o ucj iHkkoksa d vkdyu ikIr dju d fy, i.kr;k lUrfyr gksrh gA

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HIGHER ORDER NEIGHBOUR BALANCED CIRCULAR BLOCK DESIGNS FOR PROPER ESTIMATION OF TREATMENT EFFECTS

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ABSTRACT

Neighbour effects from adjacent units are very common in agricultural, clinical, horticultural and agro-forestry experiments. Inference from an experiment may be substantially affected by improper handling of neighbour effects from adjacent experimental units. Hence, for increasing the precision of an experiment where evidence of neighbour effects from adjacent units can be witnessed, it is advisable to incorporate neighbour effects into the model. Here, a block model with directional neighbour effects arising from the adjacent units on either sides has been considered. Further, a class of complete circular block design balanced for directional neighbour effects from the adjacent units up to distance k-1(where k is the block size) on either side has been obtained. The designs so obtained are totally balanced for estimating direct and neighbour effects of treatments.

iLrkouk

fdlh Hkh oKkfud vuqla/kku e] ijh{k.k ,o ijh{k.k ij vk/kkfjr o/k fu"d"kksZa ikIr djus nkuksa gh vko';d y{k.k gA fdlh ijh{k.k dh vfHkdYiuk] ijh{k.k ij vkuoky [kp] ijh{k.kksaRed lkexh dh miyC/krk rFkk mldh mnn'; d vk/kkj ij gh fuHkj djrh gA ifj'kq)rk dh Lohdk; dkfV ij ifjdYiuk ijh{k.k gr ijh{k.kksa dh lko/kkuhiod vfHkdYiuk djuk vR;ko';d gkrk gA vr% ijh{k.k vfHkdYiuk fdlh Hkh oKkfud vuqla/kku dk vko';d vx gkrk gA oKkfud ijh{k.kksa dh vfHkdYiukvksa d fuek.k e ijh{k.kksaRed lkexh e fo"kekxrk gksuk ,d vfr egRoi.k leL;k gA ijh{k.kksaRed lkexh e LFkkuh; fopj.k dh fu;fU=r dju gr Cykd vfHkdYiukvksa dk i;kZ] lEi.k ijh{k.kksaRed

lkexh dk legk@Cykd e bl idkj foHkkftr djd fd;k tkrk g fd ijh{k.kkred bdkb;k lEi.k lkexh dh ryuk e ,d Cykd e lekx gkA ,d ikjEifjd Cykd ekMy e ;g ekuk tkrk g fd vufØ;k ml lykV ij i;Dr lxr Cykd iHkko d vfrfjDr] fd lh bdkb@lykV dh mipkj l gh iHkkfor gkrh g A rFkkfi] fcuk Qkly okyh] NkVh bdkb;k e pyk; x; —df"k [kr ijh{k.kk e mipkj vrjk d vkdyuk e lehiorh bdkb;k e i;Dr mipkjk d dkj.k fopyu vk ldrk gA mnkgj.k d fy,] Qly k dh fofHkUu fdLek d ijh{k.kk e de yEckb okyh fdLek ij lehiorh yEch fdLek dh Nk;k d dkj.k udkjkRed iHkko iM ldrk gA ;gk lehiorh lykV ,d nlj ij iHkko Mkyr g rFkk mipkjk d eY;kdu e vfHkufr dk xEHkj lkr gA lehiorh bdkb;k dk iHkko ijh{k.k d ifj.kke e ifjoru yk ldrk g rFkk n{krk dk udkjkRed #i l iHkkfor dj ldrk gA ,lh fLFkfr e] mipkj iHkkok dk ryukRed v/;;u djr g, vfHkufr l cpu d fy, ;g vko';d gk tkrk g fd fdlh Hkh mipkj ij bld fudVorh dk udkjkRed iHkko uk iMA bld fy, Øep;kRed #i l lUrfyr vfHkdYiukvk dk i;kx fd;k tkrk gft le mipkjk dk forj.k bl idkj fd;k tkrk g fd dkb Hkh mipkj] iR;d vU; mipkj d lkFk fudVorh d #i e leku ckjEckjrk d lkFk vkrh g A vr% ;g vko';d g mfpr fof'f"Vdj.k d fy,] fn; tku oky ekMy e fudVorh iHkko lekfgr gkA ucj iHkkok dk lUrfyr dju okyh vfHkdYiukvk d fuek.k ij ,t t ,o lg;kxh (1993)] cy (2003)] rkej ,o lg;kxh (2005)] tYxh ,o lg;kxh (2006)] oxhl ,o lg;kxh (2011)] Hkkfed ,o lg;kxh (2012)] Hkkfed ,o lg;kxh (2014) }kjk lk;kIr dk; fd;k x;k gA

fudVorh iHkko doy fudVre fLFkr bdkb;k dk fn; x; mipkjk d dkj.k gh ugh gkr] cfYd ryukRed #i l vf/kd njh ij fLFkr bdkb;k dk fn; x; mipkjk d dkj.k Hkh mRiUu gkr g A vr% fudVorh iHkko fudVre bdkb;k rd gh lhfer ugh jgr cfYd vkx dh bdkb;k rd Hkh tk ldr g tl chekfj;k dh Nkuchu oky ijh{k.kk e bukdye&ilkj d dl en[ku e vkrk gA bld vfrfjDr] ;g ckr Cykd Lrj ij Hkh n[ku e vkrh g tl kfd Qy o{kk d lkFk fd; tku oky ijh{k.kk d fy, fdlh Qy o{k dh 'kk[kk (bdkb) fo'k"k dk fn; x; mipkj dk iHkko ml h o{k dh n ljh 'kk[kkvk (Cykd) d ifj.kke ij ik;k tkrk gA vr% vf/kd njh rd iHkko Mkyu oky fudVorh iHkkok d fy, lUrfyr Cykd vfHkdYiuk dh vko';drk gA

df"k ,o unkfud ijh{k.kk e ,lk gk ldrk g fd dN fo'k"k ijh{k.kkRed bdkb;k (mnkgj.kkFk dN ok;jy@cDVfj;y@Qxy dYpj) ,lh pØh; 0;oLFkk e LFkkfir dh tkrh g tgk lyV dh fdlh Hkh fn'kk e dYpj d Qyko d dkj.k bdkb;k dN viR;{k iHkko NkMrh g A ;g Qyko doy fudVre lyV rd gh ugh gkrk vfir dN vf/kd njh ij fLFkr lyV rd tkrk g A ,lh ifjfLFkfr;k e ;g egRoi.k gk tkrk g fd mu bdkb;k d dYpj d iHkko ij fopkj fd;k tk; tk fdlh Hkh fn'kk e vf/kd njh ij vofLFkr g A bl y[k e fdlh Hkh fn'kk e i njh ij fLFkr ($1 \le i \le k-1$ tgk k Cykd dk vkdkj g) fudVLFk bdkb;k d fn'kkRed ucj iHkkok oky Cykd ekMy ij fopkj fd;k gA ijh{k.kkREkd 0;oLFkk dk ifjHkkf"kr fd;k x;k g rFkk dN lkekU; ifjHkk"kk, Hkh nh xb gA k-1 (vf/kdre) rd dh njh d fudVorh bdkb;k l fn'kkRed ucj iHkkok d fy, lrfyr vfHkdYiukvk dh J[kyk fufer dju dh fof/k;k ij fopkj foe'k Hkh fd;k x;k gA

ijh{k.kkREkd 0;oLFkk rFkk ekMy

ge ;gk n ijh{k.kkRed bdkb;k] v VhVeV rFkk b Cykd okyh Cykd vfHkdYiukvk dh ,d J.kh ij fopkj djx A ekuk y_{ij}, j^{th} Cykd e i^{th} lykV ($i=1,2,..k; j = 1,2...b$) dk ifj.kke gA ekuk fd ijh{k.k Hkyh idkj vyx cuk, x; Cykdk e fLFkr NkVlykVk e lpkfyr fd;k tkrk g tcfd Cykdk e fLFkr lykVk d chp dkb xkM {k= ugh g A Cykdk oRrkdkj g vFkkr mipkj ,d cUk e bl idkj 0;ofLFkr fd; tkrk g fd iR;d mipkj fdlh Hkh vU; mipkj d nkuk vkj fLFkr gkrk g vFkkr u ($1 \le u \le k-1$) njh ij ,d fLFkj ckjEckjrk oky ucj d #i e Dykd okbt rFkk ,fUVDykdokbt gkrk g A

fdlh Hkh fn'kk l fn'kkRed ucj iHkko okyh ,d Cykd vfHkdYiuk d fo'y"k.k gr fuEufyf[kr fu;r iHkko ;kxkRed ekMy ij fopkj fd;k x;k A

$$y_{ij} = \mu + \tau_{(i,j)} + \delta_{1(i-1,j)} + \gamma_{1(i+1,j)} + ... + \delta_{(k-1)[\{i-(k-1)\},j]} + \gamma_{(k-1)[\{i+(k-1)\},j]} + \beta_j + e_{ij}$$

Tkgk y_{ij}, j^{th} Cykd e i^{th} lykV l ikIr ifj.kke g] μ lekU; ek/; g] $t_{(i,j)}$ j o Cykd d *i* o lykV e yxk, x, mipkj dk iR;{k iHkko g] $\delta_{u[i-u],j]}$ (u = 1,2,…,k-1) u njh ij fLFkr fudVorh bdkb;k l ck; ucj iHkko g] $\gamma_{u[i-u],j]}$ u njh ij fLFkr fudVorh bdkb;k l nk; ucj iHkko gA β_j, j^{th} Cykd iHkko g rFkk e_{ij} 'kU; ek/; o fLFkj fopj.k d lkFk =fV in g A ucj iHkko okyh Cykd vfHkdYiukvk l lEcfU/kr dN lekU; ifjHkk"kk, nh xb gA

ifjHkk"kk 1% oRrkdkj Cykd vfHkdYiuk dk k-1 njh rd fn'kkRed ucj iHkkok d fy, lUrfyr dgk tkrk g ;fn ;g u njh ij $(1 \le u \le k-1)$ fn'kkRed ucj iHkkok d fy, lUrfyr gkA vFkkr] dkb Cykd vfHkdYiuk u njh ij fLFkr fudVorh bdkb d] fn'kkRed ucj iHkkok d fy, lUrfyr dgh tkrh g ;fn leku ckjEckjrk d lkFk (t l μ_1) fdlh Hkh ,d mipkj d fy, bll njh ij fLFkr fdlh Hkh fn'kk e ucj d #i e iR;d vU; mipkj mifLFkr gkrk gA

ifjHkk"kk 2% i njh rd fLFkr fudVorh bdkb;k d ucj iHkkok okyh dkb Cykd vfHkdYiuk ilj.k lUrfyr vfHkdYiuk dgykrh g ;fn iR;{k iHkkok e fdlh vkdfyr ekfyd 0;frjd dk ilj.k fLFkj gk (ekuk V_d) ck;h rjQ u njh rd fLFkr bdkb;k d ucj iHkkok e fdlh vkdfyr ekfyd 0;frjd dk ilj.k fLFkj gk (t l V_{Lu})] nk;h rjQ u njh rd fLFkr bdkb;k d ucj iHkkok e fdlh vkdfyr ekfyd 0;frjd dk ilj.k fLFkj gk (t l V_{Ru})A

,d Cykd vfHkdYiuk i.kr% lUrfyr gkrh g ;fn $V_d = V_{Lu} = V_{Ru}$ $(1 \le u \le k-1)$

fuek.k fof/k

bl [k.M e] k-1 njh rd fLFkr lHkh fudVorh bdkb;k d ucj iHkkok d fy, lUrfyr i.kr% oRrkdkj Cykd vfHkdYiuk d fuek.k dh fof/k dk fooj.k fn;k x;k gA

fof/k% ,tk; l lg;kxh (1993) }kjk v-1 Cykd] ftue lHkh dk vkdkj v (> 5) g] okyh vfHkdYiukvk dk u njh $(1 \le u \le k-1)$ ij fn'kkRed ucj iHkkok d fy, lUrfyr fn[kk;k x;k gA v (fo"ke l[;k) mipkj d fy, vfHkdYiuk d v-1 i.k Cykd dh lkexh vkx&ihN fudVorh mipkjk d chp 1,2,..v-1 vUrj oky Cykd e i½frc¼ Øe e VhVeVk dk fy[kr g, ikIr fd; tk ldr gA iFke Cykd mipkj e 1 dk vUrj j[kr g, ikIr fd;k tk ldrk g] nljk Cykd mipkj e 2 dk vUrj rFkk blh idkj vkx d Cykd $(v-1)^{th}$ Cykd d fy, (v-1) dk vUrj j[kr g, ikIr fd; tk ldr gA vfHkdYiuk d i.kr;k fy[k yu ij lHkh Cykd u njh $(1 \le u \le k-1)$ rd oRrkdkj #i l 0;ofLFkr fd; tkr g] ifj.kkeLo#i v = k, b = (v-1) = r, m_1=1 d lkFk u njh rd fLFkr Bhd fudVre bdkb;k d ucj iHkkok d fy, lUrfyr Cykd vfHkdYiukvk dh ,d J[kyk ikIr gkrh g] tgk r vfHkdYiuk e fdlh mipkj fo'k"k d vku dh ckjEckjrk gA

vfHkdYiukvk dh bl J.kh gr u $(1 \le u \le k-1)$ njh rd fLFkr ucj iHkkok dh x.kuk djd i njh rd ucj iHkko o iR;{k iHkkok d vkdyu d fy, lpuk&vk0;g fuEu idkj ikIr fd; tkr g%

$$C = \frac{v[v-(2u+1)]}{(v-2u)} \qquad \text{——}) \ , v > (2u+1)$$

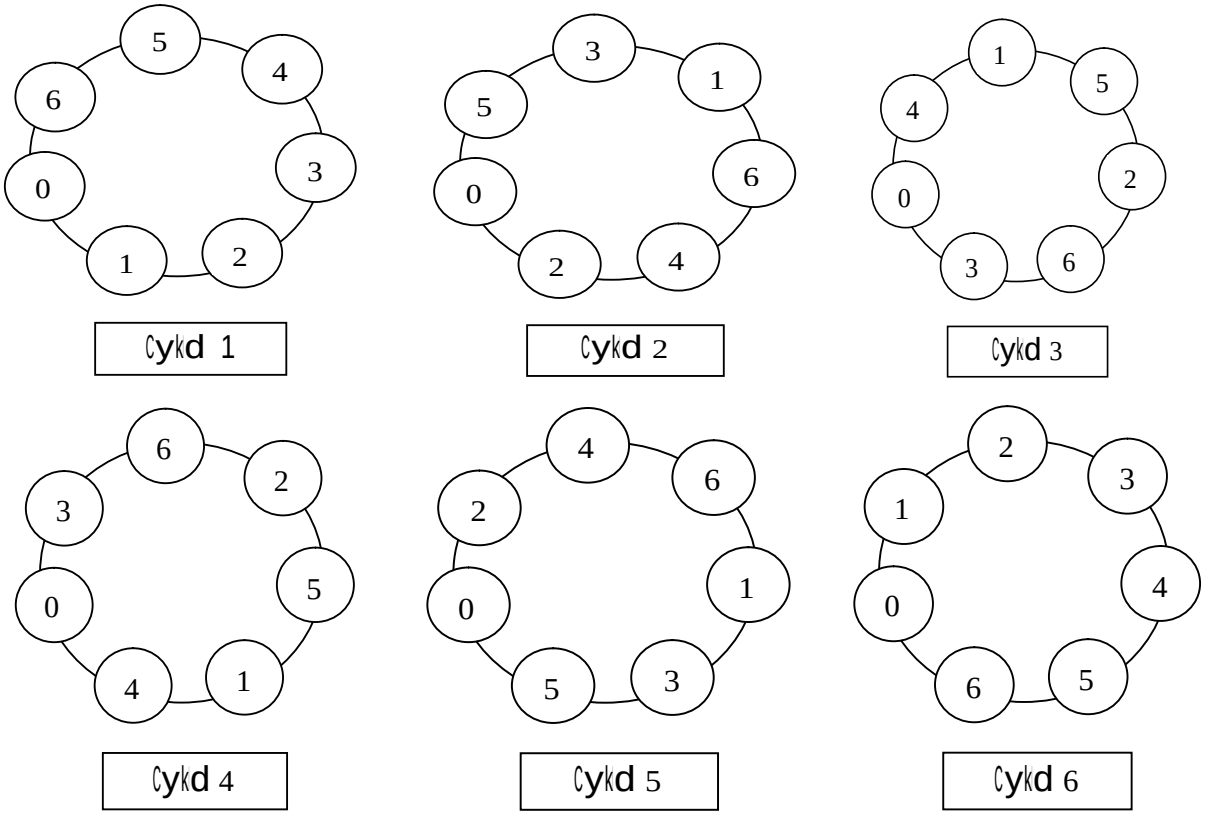
vr% mipkjk d iR;{k iHkkok l lEcfU/kr 0;frjd rFkk fdlh Hkh fn'kk e i njh rd fudVorh bdkb;k d fn'kkRed ucj iHkkok d vkdyu gr ;g vfHkdYiuk i.kr;k lUrfyr gA

mnkgj.k% v =7 = k, b = 6 = r, μ_1 =1 ikpyk d fy, fdlh Hkh fn'kk e 6 dh njh rd fLFkr fudVorh bdkb;k d fn'kkRed ucj iHkkok d fy, i.kr% oRrkdkj Cykd vfHkdYiuk uhp nh xb g A

fVIi.kh

;|fi mnkgj.k e of.kr vfHkdYiuk 6 rd dh njh d ucj iHkko d fy, lUrfyr g rFkkfi bl vfHkdYiuk fo'k"k gr ek= 2 rd dh njh d fy, gh ucj iHkko ,o iR;{k iHkko d fy, lpuk vk0;g dh x.kuk dj ldr gA 6 rd dh njh d ucj iHkko d fy, lpuk vk0;g dh x.kuk dju d fy, 13 l vf/kd mipkj okyh vfHkdYiuk dh vko';drk gkrh g A

mPp de ucj lrfyr pdh; Cykd vfHkdYiuk,



fp=&1 % v = 7 = k, b = 6 = r, μ_1 = 1 ikpyk d fy, i.kr% oRrkdkj Cykd

vkHkkj

;g vuqla/kku dk;Z lkfyr dju d fy, vko';d vkfFkd lgk;rk miyC/k djkus d fy, ge foKku ,o ik|fxdh foHkkx] Hkkjr ljdkj] ub fnYyh (okbM lD'ku u-SR/S4/MS:650/09)] dk /kU;okn djr gA

lnHk

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