

I QkbZ I g&Jskhdkj d ; æ ds ipkyu eadBkj Je dks de djuk %, d JefoKku I ædh I g; kx

vkj-vkj- iknknj] ih, l- frokj] lkkdj 'lpyk*] vujkx iVy , oafode T; kr

Hkk-N-vuqi- dlnh; dfrk vfhk; kf=dh I lFku] uchckx] Hkks ky&462 038] e/; inskj Hkkjra

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I kjk

dlnh; dfrk vfhk; kf=dh I lFku] Hkks ky }kjk vutkadk okanrk I QkbZ@Jskhdj .k dsfy, dlnz I kM o Cyksvj I kM dh Oe'k%240 rFk 720 pØ ifr feuV dh xfr ikr djsdsfy, , d I kbfdy pu LikdV ; æ okys iMy pkfyr I QkbZ I g Jskhdkj d ; æ dk fodkl fd; k x; k FkA I kFk gh ekuoh; Åtkz dks iMyak }kjk vf/kd n{krk iwkZrjhdsl s mi ; kx eaykusdsfy, I lFku }kjk gky gh ea, d Mk; uki kM fodfl r fd; k x; kA Mk; uki kM , d iMy pfyr ?æusokyk ; æ gSftl sekua Jfed rFk fdl h Hkh jkVjh e'khu dsl ello; I smi ; kx fd; k tk I drk gA fodfl r fd, x, Mk; uki kM dk mi ; kx ey iMyak ; æ izkkyh ipkyu eaykusokys Je dh ryuk eal QkbZo Jskhdkj d ; æ ds ipkyu eaykus okys Je I sdh xbA ey bdkbZeadn I åks'kukadsk'pr-Mk; uki kM dk I ello; I QkbZ I g Jskhdkj d ; æ I sfd; k x; kA yxHkx 168-4 I æh vk r ÅpkbZrFk 54-4 fdxk- otu okysvkB iq "k Jfedkadksbl v/; ; u eal fefyr fd; k x; kA I QkbZ I g Jskhdkj d ; æ dks I ks kchu vut dh I QkbZo Jskhdkj d dsfy, iz kx fd; k x; kA eWk iMyak ; æ izkkyh rFk Mk; uki kM dsl kFk I QkbZo Jskhdkj d ipkyu dsnjsku Jfedkadk an; dh /kMedukadkseik x; kA ey iMyak ; æ izkkyh dsl kFk e'khu pykusdsnjsku vk r an; nj 114 /kMedusdh vk r nj 108 /kMedusfeuv¹ Fkha ey ; æ izkkyh dh 303 fdxk- ifr ?k.Vk dh dk; Z{kerk dh ryuk eal Mk; uki kM ds iz kx I s; g c<dj 345 fdxk- ifr ?k.Vk gks xbA e'khu dh dk; Z{kerk rFk an; nj dks /; ku eaj [krsqg Mk; uki kM I s; æ ds 9 dBkj Je eagbZ deh ey ; æ izkkyh dh ryuk eal 25-4 ifr'kr Fkha

'k dæf%dBkj Je eadeh Mk; uki kM ikyj gkVZjV] iMy pkfyr I QkbZ I g&Jskhdkj d ; æ] dk; Zdsnjsku ukMh dh xfra

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Drudgery reduction in operation of cleaner-cum-grader: An ergonomic intervention

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ABSTRACT

A pedal-operated cleaner-cum-grader having common bicycle chain-sprocket mechanism to get the speeds of 240 and 720 rpm of eccentric shaft and blower shaft, respectively for the desired cleaning/grading of grains was developed earlier by CIAE, Bhopal. Also, in order to utilize the human energy in more efficient way through pedalling mode, CIAE has recently developed a dynapod. The dynapod is a pedal operated rotary device, which can be used as an interface between human worker and any rotary-type machine. The developed dynapod was used to operate the cleaner-cum-grader to assess the drudgery reduction in its operation in comparison to original pedalling mechanism. The dynapod was interfaced with the cleaner-cum-grader by carrying out minor modifications in the original unit. Eight male agricultural workers with mean stature and weight as 168.4 cm and 54.4 kg, respectively participated in the study. The cleaner-cum-grader was used for cleaning and grading of soybean grains. Heart rate of the workers was measured during operation of cleaner-

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cum-grader using the dynapod as well as the original pedalling mechanism. Mean working heart rate during operation of machine with original pedalling mechanism was 114 beats min⁻¹ as against 108 beats min⁻¹ in case of pedalling with dynapod. The work pulse (Δ HR) with the original pedalling mechanism was 35 beats min⁻¹ as against 29 beats min⁻¹ during pedalling with dynapod. The output capacity of the machine increased from 303 kg h⁻¹ in case of original pedalling mechanism to 345 kg h⁻¹ with dynapod. Considering the cardiac cost as well as output of the machine, the drudgery reduction by using dynapod with cleaner-cum-grader was about 25.4% as compared to the original pedalling mechanism.

Key word: Drudgery reduction, Dynapod, Heart rate, Pedal-operated cleaner-cum-grader, Work pulse.

ÅLRÅkouk

ekuoh; Åtkz dks l keld; r% gkFkka ds ek/; e l s iz sœ eayk; k tkrk gÅ l kbfdy dsvkfo"dkj dslk'pkr-gh ekuoh; eka i s'k; ka l s'kDr fodfl r djusdsfy, i s ka dk iz sœ i kjEHk fd; k x; kA gkFk l sfdl h ifg, dkspykus dh vi s k de FkdkoV dsl kFk i s i s i My pykus l s, d 0; fDr mrug gh ; k ml l svf/kd Åtkzdk l 'tu dj l drk gÅ mPPk 'kDr dh Jskh ea i My 'kDr dk i æ k iz sœ 0; k; ke l i f'k{k.k} [ksydm] i qzkl xfrfof/k; ka ds nkjku l kbfdy l sgh fd; k tkrk gÅ fuEu 'kDr dh Jskh ea i My 'kDr dk iz sœ d'k fuekz k rFk fo l Åtkz l 'tu ds(ks= eaykHknk; d gls l drk gS tgkafo l r; vFkok vkrfjd Toyu batu 'kDr dk eV; vf/kd gSvFkok og miyC/k ugha gÅ d'k ipkydka ea [kkl r s ij i My 'kDr dk l keld; mi; sœ i kuh i Ei dju s Ql y Fk l æ] eQyH QkMk b] vukt l sHk k vyx dju s eDdk fNykb] vukt i hl u s pjs dh dVkbZ vkfn dk; k eaf d; k tk l drk gÅ d'k ea d i My pkfyr iz sœ gÅ dl kok x b j t] dkW h i Yi j] dkMh@vukt dsfNyds mRk j us dk ; æ ½gyj ½ rkm+ dsQy rkm us dk ; æ ¼ ke uV Ø d j ¼ j s k s ¼ l y euhy k] gEi vkfn ½ dk QkMk b] ; æ ¼ Md k fV b j l ¼ folp d ; k gkbLV] Hk l s dh xkBs cdkus dk ; æ ¼ syj ¼ i k W j t Oghy ¼ d f g k j dk ifg; k l l p k g ; fi l k b Z ; æ k a ¼ x k b U M j t ¼ v k f j ; ka vkfn rFk V k ; j i Ei t dsfy, yphyk l k f V M k b o A

l Hk h of. k r ; æ ka dks ipkfy r djus ds fy, dHk&dHk l kbfdy dk mi; sœ fd; k tk l drk gSfdUr q ; g mi k ; n {krki w k Z ugha gÅ vr%mi ; Ø r iz dk j l s f M t k b u d j d s f u f e r fd ; k x ; k M k ; u k i k W dh i k j f E H k d r F k k c k n e a j [k j [kko dh ykx r de gkrh gÅ M k ; u k i k W , d i k s / æ y i M y p k f y r Å t k z l ' t u ; æ g s f t l e a , d L V S M l h v] g s . M y c k j] i M Y l r F k k L i k d l / O g h y y x k ; k x ; k g Å ; g u k e n k s x h d ' k o n k a ~ M k ; u k ~ v F k k z ~ ' k D r v l s ~ i k W ~ v F k k z ~ i s l s f e y d j c u k g Å b l ; æ d k s e k u o J f e d r F k k f d l h H k h i p k f y r d h t k u s o k y h j k s / j h i z d k j d h e ' k h u d s c h p i z sœ f d ; k t k l d r k g Å M k ; u k i k W d h ' k D r i p k y d d s v k d j o L o k L F ; r F k k i M f y a x d j u s e a f n , x , l e ; d h

ek=k ds vuq lk i f j o f r r g k r h g Å Q l y m x k u s d s e k s e d s n k s k u M k ; u k i k W } k j k i E i i p k f y r f d ; k t k l d r k g s d V k b Z d s n k s k u F k k j p y k ; k t k l d r k g S r F k k i j s o " k Z H k j v u k t f e y ¼ p D d h ½ d k s ' k f D r i n k u d h t k l d r h g Å ; g i k s / b y g k u s d s d k j . k b l s , d L F k k u l s n l j s L F k k u i j y s t k ; k t k l d r k g Å

i M y d h ' k f D r l k ; k k j . k d s v u q h y , d u o h d j . k h ; Å t k z l = k r g s f t l l s o ; f D r L o L F k j g r k g Å i M y ' k f D r l s , d 0 ; f D r d e i z k l d e F k d s g q m l h n j i j ; æ d k s i p k f y r d j l d r k g s f t l n j i j o g g k F k l s Ø f d a x d j r k g Å i M y ' k f D r l s p k f y r ; æ k a t s a f o u k s j d k s r h o z n j l s p y k ; k t k l d r k g s r F k k v f / k d ' k f D r d h v k o ' ; d r k o k y s ; æ ¼ F k k j ½ d k s v k l k u h l s i p k f y r f d ; k t k l d r k g Å

[ksydm rFk i qzkl dsnkjku l kbfdy dslk sœ l ædkh Je ij miyC/k l kfgR; eadkQh 'kkk dk; Zn'kz k x; k gSl hcjh , V vy] 1977 ykx r , V vy] 1986 ek'kz vls ekfVZ] 1993 ek'kz vls ekfVZ] 1997 us P; w vls gy] 1999 ek'kz , V vyA] 2000 xhrs , V vy] 2020A rFkfi i My 'kDr dk 0; kol kf; d dk; k a t s a f L F k j : lk ead'k l ædkh ipkyuka ij igyscg r de /; ku fn; k x; kA bu fcln yka dks /; ku eaj [krsgg Hk- N- vuq i- d b n h ; d'k v f l k ; k a = d h l l F k k u] H k k i k y e a , d v / ; ; u f d ; k x ; k r k f d ' k f D r k d h e k = k j i M f y a x n j] l h v d h Å p k b z r F k k Ø f d d h y E c k b z d s b " V r e c u k d j H k k j r h ; d'k J f e d k a d s f y , d M k ; u k i k W d k f M t k b u r s k j f d ; k t k l d a ¼ i m i , 2012 ½ f M t k b u f d , x , M k ; u k i k W d s g k F k l s i p k f y r f d , t k u s o k y s j k s / j h e D d k f N y k b Z ; æ d s f y , l Q y r k i m b l i z sœ f d ; k x ; k A b l l s e ' k h u d h d k ; Z k e r k e a m Y y s [k u h ; o f) ¼ 44-42 f d x k - i f r ? k a / k g k F k l s Ø f d a x d h r y u k e a M k ; u k i k W i M f y a x } k j k 282-7 f d x k - i f r ? k a / k ½ n s [k h x b A l k F k g h d k ; Z d j r s l e ; u k M a d h n j e a ¼ 59-4 / k M e d u i f r f e u V d h r y u k e a 35 / k M e d u i f r f e u V d h d e h H k h n s [k h x b Z A

v l ; d b Z g L r p k f y r f L F k j e ' k h u a t s a i M y p k f y r l Q k b Z @ J s k h d k j d] v k y w f N y k b Z , o a v k y w d s V p l M a d j u s

dh e'khu] vukt fey] e'kQyh QkMkbl ; æ] /kku Fk k] pkjk dVkbz ; æ vlfm mi yC/k gA ; sl Hkh e'khuas dsek/ ; e l si pkfyr djds gkFk l spykbz tkrh gSvFkok gkFk vS i j nksuka l spykbz tkrh gSfQj Hkh ekuoh ; eka i s'k ; ka dk iz kx djusokys ; snksuka ÅtkL=kr n{k ughagSrFkk bul s i pkyd dksFkdku vf/kd gkrh gA Mk ; uki kM dk n{krki wkz mi ; kx djdsdBlj Je dksdjusds l kFk gh bu e'khuladh l exz mRi kndrk dks c<kus dsfy, fd ; k tk l drk gA Mk ; uki kM dh n{krk eoof) djusdsfy, ml sds d' vflk- l kFku dh fMtkbu okysi My pkfyr l QkbZ l g&Jskhdkj d ds l kFk tkMlj pyk ; k x ; ka mi ; Ør fclnq/kadks/ ; ku ea j [krs gq Mk ; uki kM dks l QkbZ l g&Jskhdkj d ds l kFk tkMlj ; g v/ ; ; u fd ; k x ; ka

I lexh ,oa i jh{k.k fof/k

v½ iMy pfyr l QkbZ l g&Jskhdkj d

iMy pfyr l QkbZ l g&Jskhdkj d ; æ ¼p=&1½ dk iz kx Fk'kæ fd, x, vukt dh l QkbZdjusdsfy, fd ; k tkrk gSft l eagYdk Hkh k] i RFkj rFkk feVvh ds NkV&NkVsd.k feysgkrs gA l QkbZ l g&Jskhdkj d ; æ ft l dh dk ; Zkerk yxHkx 300 fdxt- i fr ?k.Vk rFkk bl e'khu ea25 fdyskte vukt dh {kerk okyk , d gkMj] , d Cyksvj] Nyfu ; ka dk , d l V rFkk l kckU ; rkj ij l kbfdy eaiz kx dh tkus okyh iMyfak ; æ izkkyh yxkbz xbz gA e'khu dh l exz yEckbz × pkMkbl × ÅpkbZ½ × w × H½ 1600 × 500 × 1000 feeh- gA e'khu dk dy ctu 110 fdxt- gA l QkbZ l g&Jskhdkj d eaiz Ør Li kDV½ i gyh rFkk Nyfu ; ka dh yEckbz × pkMkbl rkfydk&1 eanh xbz gA

¾½ Mk ; uki kM

Hkjr ; d f'k Jfedkadsfy, yEch vof/k rd iMy pykrs gq eka i s'k ; ka dh 'kDr l sdk ; Zfu"i knu 60 okW gA bl ek=k ea'kDr rFkk b"Vre iMy pykusdh nj ij 'kjhfd

rFkk euk kjhfd i frfØ ; k U ; ure vFkkZ} 50 pØ i fr feuV Fk ¼wari, 2011½ bl vk/kj ij , d Mk ; uki kM dk fMtkbu r\$ kj fd ; k x ; k ¼p=&2½ tkfd 50 pØ i fr feuV dh xfr ij yxkrkj i pkfyr fd ; k tk l dA Mk ; uki kM ea23 fdxt- Hkjr rFkk 520 feeh- dsØ ; kl dk , d QykbØghy yxk ; k x ; k gA Mk ; uki kM dh l exz yEckbz × pkMkbl × ÅpkbZ½ × w × H½ Øe'k%1175 × 503 × 1100 feeh- gA Mk ; uki kM dk dy otu 68 fdxt- gA

¼ ½ Mk ; uki kM dks l Qkb&l g&Jskhdkj d ; æ ds l kFk tkMk

iMy ; æ izkkyh ds l kFk okN r l QkbZo Jskhdj.k i klr djusdsfy, l Qkb&l g&Jskhdkj d ; æ dh iMy pykusdh nj yxHkx 72 pØ i fr feuV gkrh gA iMy pykusdh bl nj ij l Qkb&l g&Jskhdkj d dñz l kQV rFkk Cyksvj l kQV dh xfr Øe'k%240 pØ i fr feuV rFkk 720 pØ i fr feuV FkA Mk ; uki kM ea50 pØ i fr feuV dh iMyfak nj ij vkmVi½ l kQV dh xfr yxHkx 167 pØ i fr feuV FkA mi ; Ør vuq kj l Qkb&l g&Jskhdkj d ; æ ds dñz l kQV rFkk Cyksvj l kQV dh okN r i pkyu xfr i klr djus dsfy, Mk ; uki kM ds vkmVi½ l kQV ea254 feeh- dh i gyh rFkk bui½ l kQV ea150 feeh- dh i gyh yxkbz xba bu ekemyh l d kks'kuka ds l kFk Mk ; uki kM dk



fp= 1: iMy pfyr l Qkb&l g&Jskhdkj d ; æ A

rkydk 1: iMy pfyr l Qkb&l g&Jskhdkj d ; æ dk foaj.kA

foaj.k	eku
cMsLi kDV ij nkrksdh l d ; k	60
NkV/sLi kDV ij nkrksdh l d ; k	18
, DI ØUVd l kQV ij oh&cV i gyh dk Ø ; kl] feeh-	228-6
Cyksvj l kQV ij oh&cV i gyh dk Ø ; kl] feeh-	76-2
, DI ØUVd l kQV xfr l siMy dschp dk vuqkr	1%33
Åijh Nyuh dk vdkj] feeh-	5-0×8-0
fupyh Nyuh dk vdkj] feeh-	1-8×20&3-2× 20
Nyuh ckM dsLVkd dh yEckb] feeh-	20
LdYij LØhu eaiz Ør fNnz dk Ø ; kl] feeh-	6

हकीर; द्रुत वृद्धि इतक

1 Qkb&l g&Jskhdkj d ; æ ds l kfk l Qyrki d tkm+ fn; k x; k $\frac{1}{2}p=3\frac{1}{2}$ Mk; uki km dsl Qkb&l g&Jskhdkj d ; æ ds l kfk tkm+fn, tkus ds lk' pkr-dhnh 'kkqV rFkk Gysv 'kkqV dh xfr 50 pØ ifr feuV dh iMfyx dh nj ij Øe'k%282 pØ ifr feuV rFkk 846 pØ ifr feuV gks xbA fp=&3 l Qkb&l g&Jskhdkj d ; æ ds l kfk tkm+ x; k Mk; uki kMA

1/2 ; æ ds ijh{k.k grq ipkydka dk p; u

l Qkb&l g&Jskhdkj d ; æ dks Mk; uki km dsl kfk tkm+ mj ml dk ey iMfyx ; æ izkkyh dsl kfk ey; kadu djsus fy, vkS r vk; j ÅpkbZ otu rFkk ckMh ekl bUMdI %ch , e vkbZ Øe'k%26-4 o"q 168-4 feeh] 54-4 fdxk- rFkk 19-2 okys vkb 0; fDr; ka dk p; u fd; k x; kA ; s0; fDr l kbfdy pykuseafuiqk FkA blgais; kx ikjkk djus ds i dZ tkudkj nh xbZ rFkk okNn iMfyx nj dksuk, j [kusdk i f'k{k.k fn; k x; kA

1/2 l Qkb&l g&Jskhdkj d ; æ dks Mk; uki km ds l kfk tkm+ mj ml dk ey iMfyx ; æ izkkyh ds l kfk ey; kadu

JefoKku rFkk ; kfi=d dk; Zkerk ns[kus ds fy, l Qkb&l g&Jskhdkj d ; æ dks Mk; uki km dsl kfk tkm+ mj ml dk ey; kadu fd; k x; kA nksukavolFkkvka e'khu ds ipkyu dsnjku i ksj gkVZjV ekMhVj e'khu $\frac{1}{2}p=8\frac{1}{2}$ dh l gk; rk l sán; ds/kMedusdh nj dkseki k x; k (Potdar *et al*, 2011, Khadatkar *et al*, 2018) iz kx dsnjku mi; kx eayk, x, uenakysvukt eady 3-33 ifr'kr vU; l kexh Fkh ftl ea2 ifr'kr Hkh k rFkk 1-33 ifr'kr fevVh ds VqdM+rFkk dndM+FkA uenakysvukt feJ.k ds vk/kkj ij Jskhdj.k grq Åijh rFkk fupyh Nyfu; kadk puko fd; k x; kA iz; kx ikjkk djus ds i dZ l Qkb&l g&Jskhdkj d ; æ ea Nyfu; kadk <yku] fNnz dh pkmkbZ rFkk LVkd dh yEckbZ tS a dN l ek; kst u fd, x, A lk; kx dsnjku 'kqd cYo dk rkieku rFkk l kiSk vknZk TkS h vkl & ikl dh volFkkvka (Ambient conditions) dks Hkh ntZfd; k x; kA ipkydka dsi ksj gkVZjV ekMhVj ; Ør pLV cYV igudj , d fuf'pr nj ij e'khu dks ipkyr djus dk funZk fn; k x; k rFkk , d /ofu , oa izdk'k eS/kuk dks bl ds l kfk tkm+



fp= 2: Mk; uki kMA



fp= 3: l Qkb&l g&Jskhdkj d ; æ ds l kfk tkm+ x; k Mk; uki kMA

fn; k x; kA dñnz l kŋV rFk Cyksj l kŋV dh okñNr xfr; ka
i klr djusdsfy, e'v'kuk dksy i Mfyx; æ izkkyh ds
ipkyu dsnŋku 72 chi ifr feuV ij rFk Mk; uki kM ds
l kFk ipkyu dsnŋku bl s50 chi ifr feuV ij l v fd; k
x; kA iz kx i kŋk djus ds i v l ipkydka 10 feuV dk
foJke fn; k x; kA foJke ds l e; ipkydka dh àn;
/kMedusdh nj dksfjdKMZ fd; k x; kA i R; d ipkyd ds
fy, nksuka fLFkr; ka ea ij h{k.k dh vof/k 20 feuV FkA
e'khu dsipkyu dsnŋku dk; Zdjrsqg àn; ds/kMedus
dh nj dk fi Nys15 feuV dsnŋku àn; /kMedusdh nj
dk vkŋ r ekuk x; kA l k; kxka dsnŋku dñnz l kŋV rFk
Cyksj l kŋV dh okñNr xfr; k fofikulu fuxr njka ij
, df=r fefJr l kexh rFk e[; vukt fudkl h }kj ij
LoPN vukt dh ek=k t s ai f k. kka dksntZfd; k x; kA ¼ l
, , l bf.M; k i k-fy-½, l , , l dh V&V i) fr dk iz kx
djrsqg e'khu dh dk; Z{kerk l QkbZn{krk} àn; /kMedus

dh nj rFk dk; Zdjrsqg ukMh dh nj l cakh vkadMædk
fo'ySk.k fd; k x; kA

ifj.Ke ,oa foopuk

¼-½ iz kx dsfy, p; fur 0; fDr; kads 'Kjhfjd ekin.M+
l Qkb&l g&Jshdkjd; æ dsipkyu dsnŋku ey i Mfyx
; æ izkkyh rFk Mk; uki kM ds l kFk ml ds; k&=d dk; Z
fu"iknu rFk iz kx ds fy, p; fur vkB 0; fDr; ka ds
'Kjhfjd ekin.M+dsekiu dsfy, iz kx fd, x, A mDr
p; fur 0; fDr; ka ds 'Kjhfjd ekin.M l cakh vk/kj Hkar
fooj.k rkfydk&2 eafn; k x; k gA p; fur 0; fDr; ka dh
vkŋ r vk; j Åpkb] otu] cKWh ekl bMDI Øe'k%26-4
o"K 168-4 l eh] 54-4 fdxk rFk 19-2 i kbZ xbA

¼-½ l Qkb&l g&Jshdkjd; æ dk; k&=d dk; Zfu"iknu
i klr fd; s x, vkadMæ l s; g nŋkk x; k fd ey i Mfyx
; æ izkkyh dh 722 pØ ifr feuV vŋ Cyksj xfr] Mk; uki kM



fp= 4: i kyj gkVZjV ekWhVj; Ør p&V cYVA

rkfydk 2: iz kx dsfy, p; fur 0; fDr; kads 'Kjhfjd ekin.MA

fo"K; dkM	vk; j o"K	Åpkb] l eh	otu] fdyokte	'Kjhfjd l jupuk ½ekWh ekl bMDI ½
S1	22	170	50	17-3
S2	22	172	51	17-23
S3	22	170	56	19-38
S4	37	168	65	23-03
S5	34	169	56	19-61
S6	21	165	48	17-63
S7	21	168	49	17-36
S8	32	165-5	60	21-93
vkŋ r	26-38	168-43	54-38	19-19

rkfydk 3: ey iMfyx ; æizkkyh ¼r1½ rFk Mk; uki km ¼r2½ dsl kFk i pkyu dsnŋku I Qkb&I g&Jskhdkj d ; æ dk dk; Zfu"i knu , oa i pkydka dh 'kjhjd i frfð; k, a

fo" k;	dk; Z fu"i knu fdxk		I QkbZ n{krk		dk; Z djrs gq àn; /Mdu		Δ àn; nj	
	ifr ?k.Vk		ifr 'kr		dh nj] /Mdu@feuv		/Mdu@feuv	
	T1	T2	T1	T2	T1	T2	T1	T2
S1	311-64	356-90	97-15	96-86	140	140	39	36
S2	293-46	342-50	96-98	97-78	101	99	34	33
S3	295-72	351-04	96-73	97-85	114	101	31	22
S4	309-38	331-36	97-54	96-74	124	110	43	33
S5	304-49	346-07	97-82	96-82	110	106	30	25
S6	297-37	345-69	96-83	97-49	106	104	31	27
S7	309-48	347-78	96-47	96-73	107	100	34	28
S8	306-32	342-33	96-84	97-87	107	105	35	30
vd r	303-48	345-46	97-05	97-27	113-6	108	34-6	29-4
SD	7-02	7-42	0-44	0-53	12-66	13-37	4-44	4-65
àn; I ækh vkM; i fr 100 fdxk- vukt dsfy, /Mdu							686	513

dsI kFk iMfyx djusdsnŋku c<ej 837 pð i fr feuV gks xbA I Qkb&I g&Jskhdkj d ; æ dh dk; Zkerk ey iMfyx ; æizkkyh ea 303 fdxk i fr ?k.Vk dh rŋuk ea mYy[kuh; : Ik I sc<ej Mk; uki km ¼rkfydk&3½ dsl kFk 345 fdxk i fr ?k.Vk gksxbZP<0.01½ e'khu dh dk; Zkerk eaof) dk i æ[k dkj.k dñz I kŋV dh c<h gðZxfr FkA dñz I kŋV dh c<h gðZxfr ds i fj.kke Lo: Ik Nyfu; ka ea I sl kexh rsth I sNudj ckj vkbA I Qkb&I g&Jskhdkj d ; æ dh I QkbZn{krk ¼ey iMfyx ; æ izkkyh dsl kFk 97-05 i fr'kr rFk Mk; uki km dsl kFk 97-2 i fr'kr½ vFkZ~; d I eku jghA bl dk ; g dkj.k gksI drk gsfð ey iMfyx ; æ izkkyh dsl kFk i pkyu dsnŋku Cykvj I kŋV dh xfr 772 pð i fr feuV gsktrh gð tksvukt eaI shk k rFk vU; v'kŋ; ka dks vyx djus ds fy, Ik; kŋr gA vr% Mk; uki km dsiz kx dsl kFk Cykvj 'kŋV dh xfr eaof) gksdk I QkbZ i frfð; k ij dkbZ i kko ugha i MfKA

¼ ½ I Qkb&I g&Jskhdkj d ; æ ds i pkyu dsnŋku 'kjhjd i frfð; k, a

ijh{k.k dsfy, p; fur fd; sx; svkB 0; fDr; ka dh àn; /Mdu nj foJke dh voLFk ea 66 /Mdu i fr feuV I s ydj 104 /Mdu i fr feuV FkA I Qkb&I g&Jskhdkj d dk ey iMfyx ; æ izkkyh rFk Mk; uki km dsl kFk i pkyr djus ij àn; /Mdu dh vk\$ r njaðe'k%113-6 rFk 108 /Mdu i fr feuV Fk ¼rkfydk&3½A rFkfi ey iMfyx ; æ izkkyh rFk Mk; uki km dsl kFk i pkyr djus ij àn; /Mdu ka dh njka ea dkbZ mYy[kuh; vrj ugha n{kk x; ka Mk; uki km dsl kFk e'khu dks i pkyr djusdsnŋku àn; /Mdu dh nj de gksdk dkj.k iMfyx nj dk de gksk

¼50 pð i fr feuV½ gks I drk gð tksfd Hkkjrh; dñk etnŋkadsfy, b"Vre dh xbZ iMfyx nj gA ey iMfyx ; æizkkyh dsl kFk e'khu dks i pkyr djus ds nŋku i pkyd dks dñz rFk Cykvj I kŋV dh dñr xfr i kŋr djusdsfy, 72 pð i fr feuV dh xfr I siM y ?kpekuk Fk] vr%àn; /Mdu nj vf/kd FkA foJke dsnŋku àn; dh /Mdu nj ¼ukM; nj] Δ àn; nj½ Mk; uki km dsl kFk iMfyx dsnŋku 29-4 /Mdu i fr feuV Fk ¼P<0.05½ tks ey iMfyx ; æizkkyh dsnŋku ¼34-6 /Mdu i fr feuV½ dh rŋuk ea dQh FkA nku ka gh fLFkr; ka eð foJke ds nŋku àn; dh /Mdu nj rFk àn; dh /Mdu nj eaof) 35 /Mdu i fr feuV I sde Fk tksfujrj dk; Zdjusds fy, Lohdk; ZI hek gA fQj Hk ey iMfyx ; æizkkyh ij dk; Zdsnŋku FkMk&FkMk foJke vko'; d gSD; kñd dk; Z djusdsnŋku /Mdu nj Lohdk; ZI hek dscgr fudV gA ey iMfyx ; æizkkyh rFk Mk; uki km dsl kFk 100 fdxk- vukt dh I QkbZ o Jskhdj.k djusdsfy, àn; dh dy /Mdu aðe'k%686 rFk 513 /Mdu i kbZ xbA bl I sir k pyrk gsfð Mk; uki km dsl kFk iMfyx djds 100 fdxk- vukt dh I QkbZ o Jskhdj.k djus ea 174 /Mdu ka dh dehan[kh xbA e'khu dh dk; Zkerk rFk dy /Mdu nj ka dks/; ku ea j[krsgg ey iMfyx ; æizkkyh dh rŋuk ea Mk; uki km dsl kFk I Qkb&I g&Jskhdkj d dk iz kx djus ij d Bkj Je ea 25-4 i fr'kr dh dehan[kh xbA

fu"d"Z

Mk; uki km dsl kFk I Qkb&I g&Jskhdkj d ; æ dsl Qyrkið tksusij ; g n{kk x; k fd; æ ds i pkyu

grql kbfdy pykusdh ; æizkkyh dk iz kx djdsi My
pkfyr jk/jh e' khukæayxusokysdBlkj Je dksde djus
dsfy, vPNh rjg fMtkbu fd; sx; sMk; uki kM dk iz kx
fd; k tk l drk gM Mk; uki kM dks gkFk l s pykbz tkus
okyh vU; jk/jh izdkj dh e' khukæds l kFk tkM elj mudh
n{krk o dk; {kerk eaof) dh tk l drh gM

I mHkZ

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