

9f8 /lxt c; ld hljx? MPs kl/ro

9f8 /lxt c; ld hljx? cyf\Dofqmf0ge/l6a0; , Dofqmf/ 0ge/l6a0; ldn] ag\$] zAb xf]hxfDofqmf\$]cy{df05\$]gfE]cfEfn]bVg ; lsg]/ 0ge/l6a0; \$]cy{9f8 gePsf hgij / xf] t; y{Dofqmf0ge/l6a0; eEgfn]9f8 gePsf xdf]gfE]cfEfn]:ki6 bVg ; lsg] hljx?nf0{hgfp5 . loglx?sf] cfsf/)-% ld=ld= b]v & ; #d= ; Ddsf] x05 . hsf, hluf, lrkns]l/f, z^av\$]l/f / ljleG vfnsf sl/fx? o; sf s]l pbfx/0f xg\ ; #f/df /x\$]f ljleG hft hfltsf 1ft hljx?d]b]sl/a &% kl|tzt hljx? o; cftuf kb5g\

9f8 /lxt c; ld hljx? w]h; f] kfglsf ; f]sf klWdf kf0G5g\ . To; h] loglx?nf0{ a]yls Dofqmf0ge/l6a0; klg elg05 . sg} 9f8 /lxt c; ld hljx? kfgl; E]allg ?rfp5g\ t sg}kfglsf]; txd f kf0G5g\ . sg}rfkl afnjdf, sg}df6df, sg}9wfsf sgfsfkrdf t sg}em/\$]kft klE/, sf7sf 6qmf cflbdf kf0G5g\ . gbl vf]; f-vf]; l hxfFkfgl lg/Gt/ alu/x\$]f] x05, ToxfFklg Dofqmf0ge/l6a0; kf0G5g\tfn, tn0f, kf]/l cflbdf klg loglx? kf0G5g\ . t/ lg/Gt/ allg] / gallg] kfgldf kf0g] Dofqmf0ge/l6a0; sf]hft km/s km/s x05 .

w]h; f]9f8 /lxt c; ld hljx? sl/f ju{cftuf kb5g\ . To; h] loglx?sf]hlj grqm klg sl/fsf]h:tf]x05 . loglx?sf]hlj grqmdf rf/ cj:yfx? x05g\ c08f, nfef{kokf / jo:s . k0f{jo:s kf]ln]c08f kf5] c08faf6 nfef{/ kokf xE]lj:tf/}jo:s cj:yf nfu5 / hlj grqm lg/Gt/ ?kdf rN5 . o:tf] rqmnf0{ k0f{kl/j t0 elg05 . ck0f{kl/j t0 eP/klg loglx?sf]hlj grqm cufi8 a95 . olb kmh nfef{glb0sg lg0km lb05 eg]o:tf] rqmnf0{ck0f{kl/j t0 elg05 . kl5 lg0km lj:tf/}w]h; f]l6sf]kl/j t0 kl5 jo:sdf kl/0ft x05 .

Dofqmf0ge/l6a0; kfl/l:ylt k0ffndf dxTjk0f{ eldsf v]5 . dVoto loglx?n] pkefQmf\$] ?kdf sfd u5{. loglx?n] s] vf05g\To; sf] cfwf/df loglx?nf0{ rf/ k\$]f/df af]8Psf]5 M ; \$/; , sn\$6/; \:qmfof/; V lk\$0/; \ ; \$/; n]kftsf 6qmfx?, sf7sf 6qmfx? cflb vf05g / dl;gf] hlj s ?kdf ?kf0t/0f ub5g\ . Amphipods, Isopods, Freshwater Crayfish cflb o; df kb5g\ . ; \$/; n] lgsfn\$] dl;gf] hlj s rlhx? vfP/ sn\$6/; \afR5g\ . loglx?n]c? ; ld hljx?n]pTkfbg u/\$]f/ eflts ?kdf pTkfbg ePsf hlj s rlhx? klg vf05g\ . Mayfly, Nymph, Mussels, Water fleas o; sf s]l pbfx/0f xg\ . :qmfof/; fn]PNul / 9wfsf]sgfsfkrdf c8]sPsf hlj s rlhx? vf05gV lk\$0/; n]rfE ; -; fg ; \$/; / :qmfof/; \vfP/ cfkn]f]hlj g lgj f\ ub5g\ Dragonfly, Damselfly larvae, dult beetles, stonefly larvae cflb lk\$0/; \kb5g\

9f8 /lxt c; 1d hljx?nf0{ xfd] j ftj /0fsf]; 'ssf] ?kdf klg ln065 . loglx?n] jftj/0f cyjf kfglsf] jftj/0fdf cfPsf ; 1d kl/j tgnf0{ klg kl|lqmf hgfpq ; S5g\ h:t} sd 3lnt clS; hg (DO) ePsf]kfgldf Red midge larvae (Chironomids) w}] kf065g\ t/ c? 9f8 /lxt c; 1d hljx? gkf0g ; S5 . blift kfgldf Dofqmf0ge/16a; sf]k|ftlo lj lj wtf Psbd}Gog xg hf65 . To; }u/L Stonefly gfdS csf] Dofqmf0ge/16a; 156f]56f] alg] lr; f] kfgldf dfq kf065 . olb s}xl sf/0fj; sns/vfgf vfgfh6o km}xf] To; Stonefly ePsf] kfgldf ldl; g ku}df jf j/k/sf] Riparian jg:klt lj gf; e0{kfglsf] tfkqmd a9g uPdf ol Stonefly x? To; kfglaf6 x/fP/ hf65g\

To; }u/L kfglsf]pH, wldnf]kg, glgnf]kg, ; jfxltf h:tf kf/fld6/x?n]9f8 /lxt cz1d hljx? hljg / k|ftlo lj lj wtf h:tf klfnf0{kl}olf ?kdf c; / kf/}f]x65 . To; }n] loglx?nf0{ kfglsf] u0f:t/ gfkgsf] lgldQ klg kpfu ug{ ; ls65 . kfglsf] u0f:t/ gfkgsf] lgldQ o; sf csf] kmf0bfhgs s'/fx? klg 5g\ h:t}loglx? ; lhn}kfpq ; S5g\ loglx?n] cfkmg] k/} hljg cyjf hljgsf] w}] cj:yf kfgldf g}latfp5g\ loglx? cfkmg]af; :yfgaf6 w}]k/ ; b}g, loglx? b0{blv tlg j if{ Dd klg af}5gV ; a}6bf dxTj k0f{ s'/f eg}f] loglx?n] kfgldf cfPsf] yf}dfq kl/j t}gsf] klg 15\$} kl|lqmf hgfp5g\ To; }n]loglx?sf]yk cl}oog cg; Gwfgsf]h?/L 5 .

- ; lznf Uj f5f

j fg:klts tGt'k}hgg lj lw MPs ; H}kt hfgsf/L

k}eld

sg}klg jg:kltsf] Golsno; oSt jfg:klts sf]f jf tGt' jf cu (i.e. explant), dfp lj?j f j f6 lgsfn] s[qd tj/n]kpfuZffndf lhj f0f/lxt jftj/0fdf lj leG /f; folgs tTjx? Id; f0{j gf0Psf] s[qd vfB -artificial nutrient medium_ df /fv] pSt explant j f6 lj?j f pT}kfbg ug]klj lwnf0{j fg:klts tGt' k}hgg lj lw elg65 . jfg:klts tGt' k}hgg lj lwsf] nflu explant; sf]f, tGt' jf cu hg; s}klg xg ; Sg] ePsf]h] o; klj lwnf0{j [t ?kdf in-vitro culture klg elg65 . jg:kltsf]sg}Pp6f Golsno; oSt jfg:klts sf]f j f6 l; E}jg:klt -whole plant_ sf]kg}j sf; ug{ ; ls65 eG]l; 4fGt -Cellular totipotency_ elg65, o; }l; 4fGtdf jfg:klts tGt' k}hgg lj lw cfwfl/t 5 . kl5 ; g\!(@@ df /lj G; gn]h/fsf]6k}f}f in vitro culture u/]. ; g\!(#\$ df 0j f06n] ; km}tk} \$ uf}he}fsf]h/fsf]sNr/ u/]. o; /L of]klj lwsf]lj sf; qmd; E} ; g|!(%@ df df}h / dfl6gn]d}l/:6d -meristem_ sNr/j f6 ef0{ ; /lxt j f6 lgsf]Ng]sf]zif u/]. o:t}; j eGbf klxn]; g\!(%\$ df e0/ / pgsf ; xsdl}lj?j fsf]Pp6f dfq sf]f ln0{

sNr/ u/] lj ?jf pTkfbg u/]. pf]klj lwsf]lj sf; ; E; E}; g|!(&! df 6fs]]/ pgsf
; xsdl{x?n]; j }ebf klxn]k]f]nfi6 -cell without cell wall_ sNr/ u/l lj ?jf pTkfbg
u/]kf0G5 . g]kndf rfx of]klj lwsf]k]f]u ; g\!(&^ df nlnk/sf]uif]j /l l:yt
/fli60 xj]od tyf jg:klt k]f]uzfnf -KATH_ c]tu{sf]t]t'k]hgg zfvfs\ :yfkf
kl5 dfq ePsf]kf0G5 . ; g\!(*) sf]bzs blv clxn]; Dd o; klj lwsf]df]bdj f6
bhē tyf n]k]d]dv jg:kltx?sf]; Af0fsf] nflu ; fy}w}]; Wofdf j]f{tof/ ug{
z]eglo kmhx?, pkof]ul j [fx? cflbsf] tyf dVotM s]ifdf lj sl; t hftsf /f]udSt
lj ?jfx? pTkfbg e0/x]f 5g\

ljfg:kltS t]t'k]hgg lj lw

o; n\ydf jfg:kltS t]t'k]hgg]tl/sfnf0{; Hft ?kdf k|tt ug]hdsf]ul/Psf]
5 . t]t'k]hgg lj lwsf] nflu rfxg]wft]f6 jg]f pks/0fx?nf0{x6 Pc/ cfeg /
sf]fj f6 jg]f pks/0fx?nf0{0G5} /df /fvL ls6f0f/lxt -i.e. sterilized_ jgf0G5 . of]
klj lwdf ; j k]yd explant -jg:kltSf] hg sf]f, t]t' jf c] ln0{t]t'k]hgg ul/G5,
To; nf0{ explant elgG5 . ; kmf kfgl -klxn] wf/f]f] kfgln] / kl5 distilled water_ /
lj leG /f; folgs kbfx?_ h:t]HgCb, C2H5OH cflb_ n]kvfnl lhj f0f/lxt j gf0G5 .
kl5 rfx]f]; Wofdf jg:kltSf] u0ff]ds j [4sf] nflu lhj f0f/lxt jftfj/0fdf pSt
explant nf0{lj ?jfsf]j [4 lj sf; sf] nflu rfxg]lj leG /f; folgs t]jx? -micro &
macro nutrients, plant hormones, sucrose, vitamin, etc._ ld; f0{j gf0Psf] s]td vfB
-artificial nutrient media_ /flvPsf]efBf -cyff flask_ df /flv xsf0G5 . lhj f0f/lxt
j gf0Psf]cyff sterilized ul/Psf] explant nf0{sNr/ } cyjf hf/df /fvg] sfd
sNr/ ?ddf, Nofldg/ Pc/ ^nf]x8 /flvPsf]6]ndf ls6f0fx?sf] cfudgnf0{x6fpg
kvf rnf0Ptfklg rf/]t/ l:k6 NofDk cyjf jg; g jg{ jfnl, 6]ndf c]nsf]nn]; kmf
u/L, To; s};]f]k]f]df /x] sfd ug]xft klg c]nsf]n]; kmf u/L :6]/nf0H8 ul/Psf]
kmf]; k cyjf j]zsf]; xfotfn]/flvG5 . /f; folgs t]jx?sf]ld>0f cg?k vfB klg
lj leG k]tsf]xG5g\ . sg]df ; j }k]f/sf]jg:kltx?sf]t]t'k]hgg ug{ldN5 eg]
sg]df jg:klt lj z]f / c] lj z]f]dfq ug{ldN5 . pbfx/0fsf]nflu Pd= P; = -MS or
basal_ u]j]f] -Gamborg{df ; j }k]f/sf]jg:klt, ; fwf/0ftof g8; g ; l -Knudson C_
df clS8, 8Jn'lk Pd -wpm_ df jx]lif6 ?v k]hft, Pg l; S; ÷r' -N6/Chu_ df,
l; l/on; -cereals_ 0 cf/ -ER_ df, sf]z]fnl -legumes_ Jxf06 -White_ d]8ofdf ; fy}
lgr -Nitsch_ df k/fusf]f, 9Fl lk=8-P= d]8oddf sNr/ ul/G5 . cg; Gwfgsf]p2]o
x]l .cuf/l] gfds /f; folgs t]j vfB -media_ df /flvG5 h; n]vfBnf0{cw{7f]
jgfp5 c]oyf vfB t/n eP/]j:5 . pSt explant /flvPsf]efBf]-culture tube÷jar_ sf]
dv Pndlgod kmf]nn]jGb u/L 0G5]g ?ddf -sf]f]sf]tkqmd @^ cyjf @& °C,
; fk]l]fs cfb]f %%%, @\$ 306fdf !^ 306f; Dd nuff/ ^nf]}; [6 nf06 -@)))-#))
Nold_ sf] k]Gw ldnf0Psf]xG5_ /flvG5 . ; fwf/0ftof t]t'k]hgg lj lwsf] nflu
lj ?jfsf]t]t'cyjf c]Esf]; fg]6qmf -i.e. explant_ s]qd vfgdf culture ul/G5 .



Tf:j l/ ! M sfFsf] ; l; ldf sNr/ ul/Psf]
Cymbidium k\hftlsf]lj ?jf



Tf:j l/ @ M sfFsf] ; l; ldf sNr/ ul/Psf]
Paulownia tomentosa Sf]lj ?jf

o; j f6 g5l\$Psf] t{t\$sf] 8Nnf]h:tf] b]vg] lk08 -undifferentiated mass of tissue_ j Gb5
 h; nf0{callus elg65 . o; /L expalnt culture ubf{k\lxn]callus j gf0 callus Sf]sub culture
 ul/ lj ?jf ptkfbg ug{cyjf l; w}lj ?jf -plantlet_ k\kt ug{eg]s/f nutrient medium
 df /flvPsf]plant growth hormones sf]dfqdf e/ kb5 . 2,4 dichlorophenoxy acetic
 acid (2,4 D - auxin) / Kinetin /fvdf callus j Gg] ; Defj gf j 9l x65 eg] Benzyl amino
 purine -cytokinin_ / ? - Naphthalene acetic acid (auxin) /fvdf plantlet j Gg] ; Defj gf
 j 9l x65 . :d/0f /xf] \olb explant /flvPsf]s[td vfB -media_ df w}] auxin / yf}]
 cytokinin sf]dfqf ldnfP/ /flvPsf]5 eg]kl5 j Gg]plantlet df root formation x65 eg
 yf}] auxin / w}] cytokinin /fvdf shoot formation df ; xofu k\ofp5 eg] auxin /
 cytokinin sf]dfqf j /fj / kf/L /fvdf callus j Gg ; Defj gf /x65 . kbZrM shoot sf]tlj |
 lj sf; sf nflu gibberellins /fvG' kb5 . o; /L j g\$sf]callus nf0{w}]; Wofdf sf6] ; fgf}
 ; fgf] 6qmf j gfpq ; ls65 / To:tf 6qmfnf0{ s[td vfgdf, sterilized condition df
 culture u/kl5 To; j f6 shoot lg:s65 / lt lgl:sPsf shoot j f6 h/f lgsflngsf]nflu
 rooting hormone (auxin) /flvPsf]rooting medium df ; fl/65 .

ttkZrft sNr/sf]nflu kpfu ul/Psf]sfFsf]ef8f]leq h/f ; lxtsf] ; fgf]lj ?jf -
 juvenile plantlets_ j Gb5 . Plantlet j g\$sf]v08df pSt ; fgf]lj ?jf -juvenile plantlets_ Sf]
 kbM explant lnP/ w}]; Wofdf lj ?j fx? kfpgsf]nflu sub culture klq ug{ ; ls65 cyjf
 o; /L j g\$sf]lj ?j fnf0{lgsfn] k\lxn] sterilized ul/Psf]j fn] df pdf/65, To; k5fl8

kzZt kfĒfl/s kbŷy{ ePsf] udnfdf luğ xfp; df ; fl/G5 / kl5 slx 7hf] ePkI5 vŷj f/ldf /flkG5 .

jfg:klts tĒt'khgg ljwŷf kŷf/x?

In-vitro culture cyfĒ tĒt' khgg jf l6:o' sNr/sf nflu jg:kltsf] hğ cæ -sfĴf, hlj/; , tĒt' jf cæ_ ln0Ē5 To; nf0{ ; fwf/oftof explant elgG5 . kŷfĴ ul/Psf] explant sf]cfwf/df o; nf0{lgDg kŷf/df j luŶ/0f ul/0sf]5 .

-s_ sfĴ sNr/ -cell culture_ Mo; df l; ŷn sfĴsf]sNr/ u/l lj?jf pTkfbg ul/G5 .

-v_ hlj/; sNr/ -protoplast culture_ Mj fŷlj?j fsf] hlj/; -sfĴfleQf lgsflnPsf] sfĴf, sfĴfleQfnf0{ 0Ēhf0dx? h:tŴ ; ĴhhĴ, kŶŶ6gĴ Ąf/f 3hgZln jgfpĴ ; lsG5_ lgsfnŶ To; hlj/; nf0{sNr/ u/l gofĴj?jf pTkfbg ul/G5 .

-u_ dŷ/i6d sNr/ -meristem culture_ Mo; sNr/jf6 ; /lft tj/n]sf08 cyjf h/fsf] glŶlkkPsf] -immature_ 6kŶŶsf] efu lgsfnŶ sNr/ u/l lj?jf pTkfbg ul/G5 . o:tf] sNr/jf6 ef0/; /lxt lj?jf pTkfbgsf]nflu /fdĴ]dfŴbd dflgG5 .

-3_ cæ sNr/ -organ culture_ Mj fŷlj?j fsf]sg}cænf0{dfp lj?j fjf6 lgsfnŶ sNr/ ugĴf0{cæ sNr/ elgG5 . cæ sNr/df h/f sNr/, sf08 sNr/, gfŶn ; ŴfdĴ6 sNr/, kft sNr/, sfĴknf sNr/, cflb kbŶg\

-a_ Sofn; sNr/ -callus culture_ MsNr/sf] nflu kŷfĴ ul/g] explant nf0{ s[gd vfBdf /fvb j Gg]sfĴfx?sf]cJojl:yt / clj eĴot ; dxnf0{Sofn; elgG5 hğ explant sf]sfl6Psf]lsgf/f j l/kl/ jGb5 . Sofn; kfpĴgsf]nflu s[td vfBdf lj?j fsf]nflu rflxg] xdfŴM auxin / cytokinin sf dfqf j/fj/ /fvĴf Sofn; j Gg] ; Defj gf j 9l /xG5 .

-r_ PĴy/ sNr/ -anther culture or androgenesis_ Mo; df kŶŶ/sf]k/fuyĴl -pollen sac_ df /xŶf k/fus0fx? lents sNr/ ul/G5 . o:tf k/fus0fx?sf] sNr/jf6 xŶnf08 lj?j fx? pTkfbgsf]nflu /fdĴ]dfŴbd dflgG5 .

-5_ eŴf sNr/ Mo; sNr/df lahf08 (Ovule) jf6 ; /lft tj/n]jo:s jf cw{o:s eŴf lgsfnŶ sNr/ u/l lj?jf pTkfbg ul/G5 . eŴf sNr/ cĒtuĒ Ĵol; n; sNr/, 0Ē8f]kd{sNr/ klĴ kbŶ .

jfg:klts tĒt'khgg ljwŷf kn0bfx?

xğ t of]klj lw wŶ}vlrĴf]xğŶf]; fy}lj zĴf ; lk -particular skill_ sf]cfj Zostf k/Ĵf klĴ o; sf]pkofĴutf tyf lj zĴftf ; fd' gu0o xğ klb5 . jfg:klts tĒt' khgg

lj lwsf] kpf] h; /; fog ptkfbg blv lnP/ SnflgE khgg ; Ddsf sfo{?df ePsf 5g\ . o; sf] kpf] zfelgo kmhx?, pkof]l j [fx? cflbsf] w]; Wofdf j of{tof/ ug{ ; fy} s]f lfdf jfnlgfnl ; wf/ ugdf ; d; ; xof] ku\$] 5 . tğt' khgg klj lwn] lj z]fu/l bhē tyf n]kfk'kv jg:kltx?sf] k/:yfg ; Af0f -ex situ conservation_ df sfz] 9uf ; flj t ePsf] 5 . o; sf] pkof]utfnf0{ ; /; tl{lgDg cg' f/ pln} ug{ ; ls65 .

? sd ; dodf yf]} sdbf/ af/f klg lj?jfx?sf] uoffTds j [4 -rapid mass propagation_ ; fg] 7fpdf ug{ ; ls65 .

? /f]udst lj?jfx? ptkfbg ug{ ; ls65 . d]/:6d slr/jf6 ef0{ ; /lxt lj?jfx? ptkfbg ug{ ; ls65 . jfg:kltst tğt' khgg ljw cftu{ ; ld khgg -micropropagation_ lj lwaf/f ptkfbg ul/Psf lj?jfx? ef0/ ; /lxt x65g\

? /f] tyf ls60f' klt/f]ws jg:klt ptkfbg ug{ldN5 .

? ptkflbt lj?jfx? Psgfzsf x65g\h; n] ubf{/fd] u0f ePsf] jg:klt -h:t} ; Gb/ kmh, ld7f] km, ptkfbg j 9l lbg] cflb_ h:t}x'x' csf] jg:klt ptkfbg ug{ ; ls65 .

? j zef0ut ?kdf /fd] kfl/Psf] sf]f] f6 k0f{jg:klt -complete plant_ sf]g}lj sf; ug{ldN5 .

? lj?jfx? l; ; ldf w]; do; Dd /Vg ; ls65 h; n] ubf{b}zlj b}zdf klg lj?jfsf] cf] f/k; f/df ; lhnf]x65 .

? kpf]uzfnfdf hdknfhd -germplasm_ ; Af0f ; lhn}ug{ ; ls65 . cfj Zostfg' f/ rfx\$]j jhdf germ plasm sf]cfbfg kpf] klg ug{ ; ls65 .

? k/Dk/fut tl/sf] f6 j zj [4 ug{sl7g ePsf jg:kltx?sf] j zef0' >f] j [4 ug{ ; ls65 .

? of]klj lw jg:klt khggdf pğgt cultivars x? lgsflngdf w]}dxTj k0f{df]gPsf] 5 .

? k/fus0f culture jf6 ; lhn} E haploid jg:klt ptkfbg ug{ ; ls65 .

? Haploid jg:kltj f6 dihaploid or doubled monoploid tyf polyploid jg:klt sf] lj sf; ug{ ; ls65 .

? o; klj lwj f6 ptkfbg ul/Psf lj?jfx?df uoffTds / ; WofTds rl/qx? -qualitative & quantitative characters_ df km/skg -i.e. somaclonal variation_ klg kf065, h; j f6 jfnlgfnlsf] ; wf/sf]nflu ; xof] ku\$] 5 .

? o; klj lwaf/f b0{leğ rl/qsf] lhj /; -protoplast_ sf] ldngj f6 j of{z\$ / -hybrid_ hft ptkfbg ug{ ldN5 ; fy} sexual incompatibility sf] ; d:ofnf0{ lg/fs/of ug{ ; ls65 .

? Sterile j of{z\$ / tyf e0f jlg; skl5 dg]s]x j of{z\$ / khfltx? (non viable hybrids_ jg:kltx?nf0{ue{khggj f6 ; lhn}j rfp] tyf w]} ; Wofdf ptkfbg ug{ ; ls65 .

- ? o; klj lwsf] kpf]lj f6 sg} klg jfnlgfnlx?df jfxo hlg (foreign gene_ :yfgfGt/Of ug{ ; lsg5 h; n] ubf{ jfnlgfnldf ; wf/ Nofpg -h:t] emf/kft gf; s ljiffib cj/f]w, sl/f gnflg] jf sl/fn] cfqmdOf ug{ g; Sg] /f] k]t/f]w]f]ds lfdtf ePsf] cflb_ ; xof] k\ofp5 .
- ? hg jfnlsf hftx?df k/Dk/fut z]h]lj f6 xf0lj 8f0h]g ug{ ; lsg5 To:tf hftx?df 0g ef06k]k/fu;]g / uef]w]g] f6 j 0f{z\$ / hft lgsflg ; lsg5 .
- ? nfebfos Dob]6x? o; lj lwj f6 lgsflg ; lsg5 / tl Dob]6j f6 /fd] /fd] jfnlsf hftx? pTkfbg ug{ ; lsg5 .
- ? slx bhē dflgPsf] jg:kltx? h; sf] jlpj f6 nfd] ; dokl5 dlZsnn] dfq pdg ; \$5 (seed dormancy sf] ; d:of ePsf_, To:tf jg:kltx?sf] seed culture u/l 5f]f] ; dod} ; wof clej [4 ug{ ; lsg5 . ; duof eGkbf{o; klj lwn] jlp pdg nfd] ; do nflg] ; d:of (problem of seed dormancy_ sf]lg/fs/0fsf]nful ; xof] k\ofPsf]5 .
- ? jfg:klt\$ eOf ljsf; -somatic embryogenesis_ jf6 klg lj?jf pTkfbg ug{ ; lsg5 .
- ? o; lj lwj f6 s[qd lj psf]lj sf; ug{ldNg] tyf s[td lj p (encapsulated seed_ jf6]lj?jf pTkfbg ug{ ; lsg5 . s[td lj pnf0{Ps b]z]f6 csf]f rflxPsf] v08df ; lhn cf] f/ k; f/ ug{ ; lsg5 .
- ? Secondary metabolite sf]clwog tyf cg' Gwfgdf ; 3fp5 .

;Gbe{; fdfu}x? (References)

k/df/, uf]j -lj = ; ≠@)^(-, tGt' khgg klj lw / o; sf]pkof]utf, xfd] ; Dkbf !@ -!)_M)-^! k].

k]wfg, gl/f -lj = ; ≠@)^(-, l6:osNr/ klj lw M Ps 5f]f]kl/ro, xfd] s]lkj [f *-&&- &(_M^* -#) k].

cf]mf, lj iof/fh -lj = ; ≠@)^\$-, jg:klt sf]f sNr/ / o; sf]kpf]ux?, s[lif a]df] ; S \$\$-\$_M(-#@ k].

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Aofl; n; l; l/c; (Bacillus cereus) - Ps xflgsf/s AofS6\of

Aofl; n; l; l/c; 8lG8 cfsf/sf] AofS6\of xf]. of] AofS6\of !=)-!=@ x #=-)%=) df0qmf]d6/ 7hf]xG5 . of]AofS6\ofsf]sf]fdf wfuf]h:tf ^nfh]hf (flagella) xG5g\h; n] o; nf0{Ps 7fpáf6 csf]7fpdf rNg ; dy{agfp5g\ Pp6f sf]f, b0{sf]f j f sf]fx?sf] 5f]f] l; lqmh:tf] agfp/ ol AofS6\of a; \$f xG5g\ . o; sf] a[4 !] b]v \$% l8u\ ; ¶6u\$sf]lardf xG5, pkoQm tfkqmd rflx"#& l8u\ ; ¶6u\$ xf]. o; n]:kf] agfp5 / of]; a[okfl xG5 .

Aofl; n; l; l/c; n] kfrgk0ffnlsf] ; d:of Nofp5 h; nf0{ kt8 kf0hlg^a (Food poisoning) elgG5 . o; n]pTkfbg ug] ^ k\$f/sf lj ifsf sf/0fn]kt8 kf0hlg^a xG5 . ol dWb] % n] kvfnf nufp5g\ / Psn]jfs]fsl nufp5 . o; n]pTkfbg ug] lj if o; k\$f/sf 5g\

- C_ Hemolysin BL(Hbl)
- Cf_ Nonhemolytic enterotoxin(Nhe)
- O_ Enterotoxin T(BceT)
- O{ Enterotoxin FM(EntFM)
- P_ Enterotoxin K(EntK)
- P] Emetic toxin cereulide

Aofl; n; l; l/c; n] blift ePsf]vfgf vfPkI5 dfG5df :j f:Yo ; d:of cfp5 . Aofl; n; l; l/c; n]; hgf ug]b0{cj :yf o; k\$f/ 5g\

!_ kvfnf

Aofl; n; l; l/c; 4f/f blift vfgf h:t}df; ; t/sf/L, bw, s\$, ; ; h cflb vfPkI5 dfG5hf0{kvfnf xG5 . o; sf nflu kl't uld vfgf; u})\$-!) ^ AofS6\ofn]k0df kj z ug]k5{ . ol AofS6\ofsf :kf] k0df hldG6 xG5g\ / lj if klg pTkfbg u5G\ . vfgf vfPsf * b]v !^ 306f leq k0 bVg] w]k6s kfglh:tf]kvfnf xg] ; s] b]vG5g\ . slxn\$flx"la/fdlnf0{jfsjfs nflu] / Hj /f]cfpg]klg xG5 . Snf]:6k8od (*Clostridium perfringens*) gfdsf]AofS6\ofn]klg o:t}lsl; dsf]kvfnf nufp5 .

@_ afGtf jf jfsjfsl

o:tf] ca:yf rflx" AofS6\ofn] pTkfbg u/\$f] lj ifoQm vfgf vfgfn] cfp5 . k[oh; f] af; l eft vfbf o:tf]xG5 . rfdndf Aofl; n; l; l/c; sf :kf] xG5g\ . vfgf ksfpbf klg ol AofS6\of db0g\ vfP/ a9l ePsf]vfgfnf0{lr; f0f g/fv] sf]fsf]tfkqmdf /fv]sf]v08df :kf] hldG6 xg yfN5g\ . hldG6 xbf AofS6\ofn]; 7]pnf08 lj if klg

pTkfbg u5g\ lj ifoQm vfgf vfPsf]! blv ^ 306fleq l/w6f nflu] af6tf cfpg]h:tf
nlf0fx? b\vf k5g\ slxn\$flx" kvfnf klq nflu ; S5 . ; fdf6otof la/fdlnf0{@\$
306fleq cfk] lgsf]x65 .

pkrf/

la/fdlsf]lb;f, af6tf tyf vfgf k/Llf0f u/7 AofS6l/of / lj ifsf] klxrfq ug{; lsg5 .
; fdf6otof, cf]flw gvfo{la/fdlnf0{; Grf]x65 . la/fdlnf0{cTolws kfgl / electrolytes
sf] ;]g ugk5{ . cfjZos k/\$f] v08df kl|thlj s kofu ug{; lsg5 . Aofl; n;
l; l/c; sf]flu l; kl]nf\$hf; g / Eof6sf]f0l; g gfdsf]kl|thlj s pkoQm x65g\

; fawfgl

- Aofl; n; l; l/c; n]ug]kt8 kf0hlg^a xg glbg sxl ; fawfgl ckgfpg' k5{M
- s_ vfgf ksfpq' / vfglar yf7}; do /Vg]cyf6 vfgf ksfpq]laltSs}vfg].
- v_ kfs6f]vfgfnf0{:6f7 u/L /Vg' k/df tIsfn lr; f]agfP/ !) l8lu|; 66ou\$e6bf
sd tfkqmdf k%ofpg].
- u_ vfgf ksfpq' cl3 / vfgf ksf0; skl5 /fd] E xft wg].

- ; latf l3ld/]

kfrg klqnof / cj zflf0f

Vfgf dfgj hfltsf] nflu cTofjZos tJj xf]. xfdln]vfPsf vfgfx?sf]; Argf hl6n
x65 . t/ tl vfPsf vfgfx? ; fwf/of ?kdf kl/of t x65g\ . Itglx? vfB gnl x6}
cf6b]df xg] sf]flo txx?df cj zfl]ft (absorb) x65g\ c6ttM a}sf]fx?n]kofu ug{
; Sg]?kdf kl/j It6 x65g\

xfdln]vfPsf]vfgdf lj z]f u/L sfa6n cyf6 sfa6f086 (carbohydrate), kl]6g, af] f]
(lipid), le6fldg / vlgh tJjx? x65g\ . le6fldg, vlgh tJj, sfa6nsf] cfwf/e6
Psf06f] ?kdf /x6f] df6f] 6]f08x? (monosaccharides) / :j t6q Pldg] Pl; 8x?
(amino acids) afx6 xfdln]vfPsf]vfgsf]76f]dfqf hl6n ; 6c0f' (macromolecule) sf]
?kdf /x6f x65g\hg ; flx ?kdf zl//n]ux0f ug{; Sb6 .

kfrg klqnof Ps o:tf]klqnof xf]h; df vfgdf ePsf 76f tyf hl6n h]j s c0fx?
hnlo lj R56g (hydrolysis) eP/ ; fgf tyf :j tM kfgldf 3lng] ?kdf kl/of t x65g\
h; nf0{hljn]kofu ug6f lglD ; xh ?kdf kfrg klqnofdf ; mlg cdfzo tyf
gnln]; f]g ; Sb5 . ; 6c0fx?sf]kfrgn]af] foQm t/nsf]; #u6f /xg ; Sg]le6fldg
(fat soluble fitamin) x? tyf lglZrt vlghx?sf] cj zfl]f0fdf klq ; xofu k%ofpb5 .

vfgfnf0{ksfpgfn] tyf vfbf v]l /fd\l rkfpgfn] 0Ghf0dx? (enzymes) sf] -vfgf krfrpg zl//df lg:sfzg xg]; fj_ vfgf krfrpg]e[dsfdf lgs}g}xb; Dd d4t kU5 . vfgfsf] kfrg tyf cjz]f]f0f klqmf ljleġ cux? ; mlg xg] cdfzo / cfġbf (gastrointestinal tract or GIT) df xg]hl6n klqmf xf].

sfafxf08x? cyfġ sfafxf08x?

sfafxf08x? kflnxf8x; cIn8xf08 cyjf kflnxf08x; sġfġx? (polyhydroxy aldehyde or polyhydroxy ketones) xg\ . cġo kbfx? h; sf] hnlo ljR5ġgaf6 ol t]jx? aġ5g\ ltglx?nf0{ klġ sfafxf08x g} eġg ; lsg5 . kġx ?kdf vfb sfafxf08x? :6fr{(starch) / Unf0sf]ġ (glycogen) h:tf polysaccharide x?, NofS6f]h (lactose) / ; ġmf]h (sucrose) h:tf disaccharide x? / s]l lgDg dfqdf Unsf]h (glucose) / k]s6f]h (fructose) h:tf monosaccharide x? Xġ5g\ . sfafxf08x?sf]yf] } dfqfsf] kfrg d\df / w] }-dfqfsf] kfrg cfġbfdf xg] ub5 h; df Unf0sf] f08]h (glycosidase) ġds 0Ghf0dn] sfafxf08x]df xg] Unf0sf] f018s aġwgx? (glycosidic bonds) nf0{ hnlo ljR5ġg ub5 . ol 0Ghf0dx? Monosaccharide Psf0sf] c0f' jf k/df0fx?sf]alr]sf]aġwg, c0fx?sf]; Argf / ljġof; (structure and configuration) df lġlb{6 xġ5g\

d\df xg]kfrg

sfafxf08x? dfq To:tf]Ps t]j xf]h; sf]kfrg d\af6 g}; ? xġ5 . vfgf rkfpg] (mastication) ġmddf y]sdf xg]cNkrf Pdf0n]h (a-amylase) cyjf 6f0lng (Ptylin) ġds 0Ghf0dn] sfafxf08x jf :6frdf ePsf cNkrf !,\$ Unf0sf] f018s aġbgx? (a- 1,4-glycosidic bonds) nf0{6ġmfP/ cNkrf-Inld6 8\$; N6x? (a -limit dextrins) -h; df Ps jf al9 cNkrf !, ^-Unf0sf] f0; 8s aġwgx? ePsf] * Unsf]h Psf0x? Xġ5g\ dfN6f]f]h (maltotriose) / dfN6f]h (maltose) agfp5g\

cdfzodf kfrg

of] efudf sfafxf08x?sf]kfrg xġg . a? To; sf] ; f6f]df cdfzodf y]sdf ePsf] Pdf0n]h (salivary amylase) 0Ghf0d cdfzodf xg]s8f cDnsf]sf/0fn]ubf{lġliqmo xg kU5 / :6fr\$]f]6ġmg]sfo{klġ /f]lsg5 .

; fgf]cfġbfdf kfrg

cdfzodf ePsf]cDnlo vfb t]jx? ta ; fgf]cfġbfdf ku]kl5 kfrg y]h (pancreas) af6 lġsf; g xg]af0sfafġġ (bicarbonate) sf]sf/0fn]ubf{t6:y xg kU5g\ . kfrg y]hdf xg]cNkrf Pdf0n]h (pancreatic a-amylase) n]:6frf0{6ġmf0{kfrg klqmfnf0{ kġmġg/tf lbġ5 / oxfFklġ cNkm !, ^ sf]aġwg TolQs}/x] cNkrf !,\$sf]aġwgx?sf] Dffq hnlo ljR5ġg xġ5 . o; af6 lġl:sg]pTkfbgx? dfN6f]h / cf0; fġfN6f]h h:tf disaccharides / oligosaccharides xġ5g\

Disaccharides / oligosaccharides x? monosaccharides df kl/oft eP/ xg] sfafxf08x?sf] clGtd kfrg klqmf eg] 8f0; \$/f08h (disaccharidases) / cf]huf] \$/f08h (oligosaccharidase) gdfs 0Ghf0dx?sf]d4tn]7hf]cfGb]sf]dflyNnf] h]hgdf gdfs efudf xG5 . ol 0Ghf0dx?sf] lfdtf ; fdfGo ?kdf kfrg klqmf sf]nflu rflxg]eGbf a9L g}xG5 . ol 0Ghf0dx? dWb]df klg ; S/h (sucrase) gdfs 0Ghf0d clt dxTj k{ xG5 h; n] ; fdfGo ?kdf elgg] lrgl (table sugar) nf0{w} -dfqdf hnlo ljR5hg ug{; Sb5 . t/ csf]tkm(NofS6h (lactase) gdfs 0Ghf0dn]; S/hn]h:tf]sfo{ ug{; Sb} / ; flx sf/0fn]ubf{bWdf kf0g]NofS6fh (lactoseor milk sugar) sf]kfrg k{ ?kdf xg kfpb} .

dfqf] \$/f08x? sf]cj zff0f

Sfafxf08x?sf] kfrgaf6 pTkfbg xg] kdv monosaccharide x? Unsf]h, kf]S6fh / uh]S6fh xg\ . tl dWb] Unsf]h dfq} *)Ü pTkflbt xG5 . ol pTkflbt tJx?sf] cj zff0f ; fg]cfGb]sf]kSj fzo / h]hgddf xg]ub5 . ^ cf}f sfaGsf]k/df0fx? xg] x\$hf]hx? % cf}f sfaGsf]k/df0fx? xg]k]6fhx? eGbf l56f]cj zfflft xG5g\ . l56f]cj zfflft xg]monosachharide x? qmdzMu]h]S6fh, Unsf]h / clg kf]S6fh xg\

cj zff0fsf]klqmf

ljleG vfnsf sfafxf08x?sf]cazff0f klqmf km/s km/s xG5g\ . Unsf]hnf0{phf{ rflxg] / ; fl]8ods] c0fx?df e/ kg]Unsf]hsf] dWb:y jfxsx? (Sodium dependent glucose transporter) n]cfGb]df kf0g]sf]fx? (mucosal cells) ; Dd k%ofpb5 . kf]S6fh]sf]cj zff0fsf]lgldt phf\$]cfj Zostf kb} / of] ; fdfGo ?kdf ; xh}Jofkg (diffusion) klqmfaf6 jfxssf]dWblytfdz cazfflft xG5 . ha lS k]6fh (pentose) x? ; fdfGo Jofkg klqmfaf6 g}cj zfflft xG5g\

k]6lg

k]6lgx? k\$[tdf cGo tJx? eGbf a9L ?kx?df b]yf kg]c0fx? xg\hg Pn-Pldgf] cDnx? (L-amio acids) sf]aXQ/ ; of]un]ag\$]xG5 . k]6lgx? sf]fx?sf]x/\$ efudf /x\$] xG5 / o; n] z/L/sf] ; Vvf lk08sf] %)Ü efu cf]6\$] xG5 . of] hljgsf] sfo{ #fngdf kdv / cfwf/e] tJ]sf]?kdf b]yf kb5 . o; n]z/L/sf]hlj t sf]fx?df lgs}g}cfj Zos / lglZrt eldsfx? v]b5 . sl/a @))) Pldgf]cDnx?sf] ; of]hgn] Pp6f kf]nk]6f08sf] >Pvnf aGb5 hg k]6f08 aWwgx?n] hsl8Psf] xG5 . kfrg / cj zff0fsf]lgldQ z/L/n]ljleG ; f]x?af6 k]6lgx? kfp55 .

Dietary, vfB ?kdf -%)-!) u] kl]t lbg_

Endogenous sources (own body residues), cfGtl/s ; f]x? #-!) u] kl]t lbg_ h; df hl0f{e0; s\$] zl//sf]kfrg gnlsf]sf]fx? kdv ?kdf kb5g\

kfll6gx?nf0{xf08f}h j f kfll6f08h (hydrolase or peptidase) gfdS 0Ghf0dx?n]n3s/0f u/L 6qmfpb5g\h; n]lj zif ?kdf kfll6f08 aGwgx? 6qmfpg]ub5 . oxl sf/0fn]ubf{ol 0Ghf0dx?nf0{kfll6f08h klg elg5 . ol 0Ghf0dx? @ k\$f/sf x5g\

cfGtl/s kfll6f08h (endopeptidase) h; n]cfGtl/s aGwgx?nf0{6qmfP/ kK; g / l6K; g (pepsin and trypsin) h:tf kfll6f08sf 6qmfX? pTkfbg ub5g\

afxà kfll6f08h (exopeptidase) h; n] Pldgf] cDnsf] cGtosf kfll6f08sf aGwgx?nf0{ 6qmfpb5 . sfafçIS; kfll6f08h (carboxypeptidase) / Pldgf]kfll6f08h (Aminopeptidase) x? **afxà kfll6f08h** (exopeptidase) xg\h; n]qmdzll cGtodf sfafçsf]k/df0f' xg]Pldgf] cDnsf]efu (C-terminal amino acid) / gf06k]hg xg]Pldgf]cDnsf]efu (N-terminal amino acid) nf0{6qmfpb5 .

kfll6gsf]kfrgdf rflxg]0Ghf0dx? (Proteolytic enzymes) cdfz0, kfrg yhl / ;fg] cfGb]n]pTkfbg ub5 . ySdf kfll6Ph (protease) h:tf 0Ghfdx? gxg]xgfn]d\va6 g] kfll6gsf]kfrg ; ? x5g .

cdfzodf kfrg

kfll6gsf]kfrg cdfzodf ; ? x5 . cdfzodf xg]; fj (gastric juice) df xf08f]ns Cdn (hydrochloric acid, HCl) x5 h; nf0{Ps cdfzosf]ljzI6 sf]fx?n]pTkfbg ub5g\ . o; n] kfll6gsf] ; f/e uof abNg ; Sb5 (denature) / vfgfx?df xg ; Sg] ls6f0fx?nf0{klg dfb5 . kfll6Ph 0Ghf0dx? lgliqmo ?kdf pTkflbt x5g\h; nf0{ kfll6Ghf0d (proenzyme) jf hf0df]hg (zymogen) elg5 hg d; jL sf]fx? (serous cells) af6 pTkflbt kK; gf]hg (pepsinogen) xg\ . ol lgliqmo 0Ghf0dx? :jptk]s (autocatalysis) sf]kfej n] jf cdfzodf xg]xf08f]nf/s cDnsf]kfej n]; lqmo xg kllb5g\ . ol 0Ghf0dx?sf]hnlo ljR5hg kl5 kfll6f08x? tyf cNk Pldgf]cDnx? pTkflbt x5g\h; n]kSj fzoaf6 sf]h; ; 6fçf0lgg\ (cholecystokinin) gfdS xdfçsf] pTkfbgsf]nflu pQ]hs (stimulant) sf]sfo{ub5 . tyflk afn aflnsfx?df eg]/lgg (renin) jf sf0df]; g (chymosin) gfdS c6o 0Ghf0dsf]klg pTkfbg x5 hg j0:sx?df kf05g . of]0Ghf0d lzzx?sf]jf afn aflnsfx?sf]cdfzodf kf065 h; n] bwnf0{6qmfP/ b\wdf xg]Sofl; g (casein) gfdS tJnf0{SoflN; od kf/fSofl; gç (Cal. paracaseinate) sf]?kdf abNb5 h; nf0{kK; gn]; lhn}krfpg ; Sb5 .

; fgj]cfGb]df kfrg klqnof

of]klqnof kfrg yhlaf6 lgl:sg] ; fj (pancreatic enzymes) x?n]ub5g\ . dflj pNny eP cg' f/, kfrg yhlSf kfll6Phx? hf0df]hg]sf]?kdf lgisf; g x5g\hg kl5 ; lqmo ?kdf kl/oft x5g\ . ol ; fj x?sf]pTkfbg cfGb]af6 lgisf; g xg]b0{kçv

xfdfğx? sf]h; :6f\$fo1gg\ (cholecystokinin) / ; \$/ğ (secretin) sf]lgisf; g kl5 ; ? xğ5 .

hf0dfğ]sf]; lqmotf

of] klqmf kSj fzodf xg] cR5fbs (epithelial) sf]fx?n] pTkfbg ug] kd\ 0Ghf0d PG67fğ]ğf08h (enteropeptidase) jf 0G67f\$foğh (enterokinase) sf] pkl:yitdf xg] ub5 . o; n] l6k; gfhğnf0{l6k; gsf]?kdf ; lqmo tNofpb5 . abnfd l6k; gn] cğo l6k; gx?nf0{ ; lqmo kfb5g\ . l6k; gn] cğo hf0dfğ]ğx? h:t} sf0df]ğk; g (chymotrypsin), 0nf:6h (elastase) / sfaffğ]ğf08h P / al (carbopeptidase A and B) cflbsf] klg ; feuf ; lqmo stf\$f]?kdf sfo{ub5 . l6k; g, sf0df]ğk; g, 0nf:6h / 0G8fğ]ğf08h? t6:y cj:yfdf (neutral pH) ; lqmo xğ5g\h; nf0{ ; ÷/g kğ]ğPhx? (serine protease) klg elğ5 lsgeg]ol 0Ghf0dx?sf]; lqmotfsf]nflu lqmfzln sğ]ğf ; ÷/g cfj Zos xğ5 . oxfCfdzodf pTkflbt cDnlo cj:yfnf0{kfrg yğ]lsf]; fl8od af0sfafğ]ğn]lg/fs/of (neutralise) ub5 . cğtodf kfrg yğ]lsf] kğ]ğPhx?sf]; du] sfoğ]:j tğq Pldgf]cDnx? / ; fgf ; fgf @-* Pldgf]cDnx? Xg]kğ]ğf08x? ağb5g\

: fgf]cfğ]sf]0Ghf0dx?áf/f

cfğ]ğf xg]cR5fbs sf]fx?df Pldgf]kğ]ğf08h? xğ5g\hg cglZrt kğ]ğf08h? xg\ h; n] nuftf/ ?kdf N-terminal Pldgf]cDnx?nf0{Ps Ps u/l 6qmfP/ :j tğq Pldgf]cDnx?, ; fgf kğ]ğf08 / 8f0kğ]ğf08x? pTkfbg ub5g\ . pTkflbt 8f0kğ]ğf08x? kğM Pldgf]cDnx?sf]?kdf 6qmf0G5g\

Pldgf]cDn / 8f0kğ]ğf08x?sf]cj zf]f0f

:j tğq Pldgf]cDnx?, 8f0kğ]ğf08x? / slx 6kğ]ğf08x?nf0{cfğ]ğf xg] cR5fbs sf]fx?n]cj zf]f0f ub5g\ . To;/L cj zf]ift 8f0 / 6kğ]ğf08x? cR5fbs sf]fx?sf] ; f06f] fhdf 8f0kğ]ğf08h]sf]; lqmotf a9l xg]xgfn]:j tğq Pldgf]cDnsf]?kdf hnlo lj R5ğg xğ5g\ . To; }sf/ofn]ubf{kğ]ğg oQm vfgf vfP kl5 kj ž g; fx? (portal vein) df :j tğq Pldgf]cDnx? dfq kf0G5g\

; fgf]cfğ]ğf :j tğq Pldgf]cDnx?sf]cj zf]f0f]lgldt Psbd}plrt sfo{kğ]ğf]sf] lj sf; ePsf]xğ5 . Pn\Pldgf]cDnx? (L-Amino acids) l8 Pldgf]cDnx? (D-Amino acid) eğb /fd\l cj zf]ift xğ5g\hg qmdzM ; lqmo / ; fwf/of Jofkg (active and simple diffusion) klqmfaf6 cj zf]ift xğ5g\

Pldgf]cDnx?sf]cj zf]f0f]sf]klqmf

Pldgf]cDnx?sf]cj zf]f0f tlg ljleğ tl/sfx?af6 xg ; Sb5 . tl dğ]ğf klg ; a} eğb ; fdfgo ?kdf b\yf kg] tl/sf ; fl8ddf lge{ xg] jfxg klqmf (Na dependent transport process) xf] hg tl/sf l8 lnsf]h (D-glucose) sf]cj zf]f0fdf klg nfu"

xG5 . csf{ plNnlvt tl/sf ; fl8oddf e/ gkgI klqmf (Na independent process) xf]. / t} f] klqmf eg] udf ln6/f0n rqm jf ld:6/ rqm (gamma-glutaryl cycle or Meister cycle) xf] hg ; fdf0tolcfcblsf] ; txdf, zlqmo ; fg ully (seminal vesicle), 0lkl88f0ld; (epididymis), dlit:s / ls8gldf ; flnt xG5 h; df kllng afx\$sf] ln6yf0cfj h:tf 6f0k}6f08x? ; mlg xG5g\

; Dk{ kllbgx? tyf kllnk}6f08x?sf]cj zff0f

hgd kZrft slx ; dosf] nflu lzzx?sf] ; fgf] cfbfn] ; Dk{ kllbgx? tyf kllnk}6f08x?nf0{cj zff0f ug{; Sb5 .

lrNnf]j f af] f]

af] fx? lj ifd oflusx? (heterogenous compounds) xg\hg sfifx?df k|/ dfqdf kf0G5 . af] fih0{af] lo cDn (fatty acid) tyf dB; f/x? (alcohol) sf] ; uaf6 lgdf0f xg]P:6/ (ester) sf] ?kdf JofVof ul/G5 . cyjf ; a}tIjx? h; n]z/L/df kpfu ug{ ; lsg]to:tf P:6/x?sf]lgdf0f ug{; S5g\ltglx?nf0{P:6/ eG ; lsg5 . d af] fx? z/L/df phf{ e08f/0fdf kdV eldsf vllg] sfifsf] agf0df ; xofu kfofpg]/ c6o w}hlj /; folg sfox?df ; mlg xg]xgfn]zl//df clt cfjZos tIj sf] ?kdf ln0G5 . hljx?df kf0g]af] f]; t{t ?kdf kf0G5g\eg]jg:ktlo af] fx? c; t{t ?kdf /x\$ xG5g\ . ljsl; t dh5x?df, jo:sx?n]klt lbg ^)-!%) ufd lrNnf]x?sf] pkefu ub5g\h; dlb] ()Ü ebf klg a9L lrNnf]x? af] f]cyf 6f0P; f0nlun; fih (triacylglycerol) xG5g\ / affs vfB lrNnf] kbfx? knf]knf]nlk8, sfh]6]fih, sfh]6]f0n P:6/x? / :j t6q af] lo cDnx? xG5g\

cdfzodf kfrg

lrNnf]kbfx]{j f af] fx? kfgldf lgs}sd 3hgZln jf 3Nb}g3Ng]xG5g\ . t/ kfrg /; x? ; a}kfgldf 3hgZln cj:yfdf xG5g\h; sf] sf/0fn] ubf{ lrNnf] kbfx?sf] kfrgdf ; d:of lgDtofp5 . t/ dfgj z/L/sf]kfrg gnldf Ps ljzif sfo{0ffnlsf] ljsf; ePsf]xG5 h; n]lrNnf]kbfx?sf] ; txl lf0km (surface area) nf0{a9f0lbG5 h; sf]sf/0fn]ubf{af] f]jf lrNnf]kbfx?sf]kfrg /df] u xg kfp5 / loglx?sf] cj zff0f klg xg kfp5 . lrNnf]kbfx?sf]kfrg cdfzodf ; ? xG5 h; nf0{cDnlo cj:yfdf klg sfo{ug{; Sg]nf0k}h gds tIjn]pIk|/t ub5 hg 0Ghf0d (lingual lipase) lha{sf]k5fl8af6 ptkfbg xg]ljZjf; ul/G5 . cdfzodf xg]nf0k}h 0Ghf0dn] 5f0f] >P\vnfx? Xg]af] fx?nf0{t6:y cj:yfdf 6qmpb5 . cdfzodf xg]af] fx?sf] kfrgnf0{vf; }df0otf lb0b} lsgeg]oxfFaf] f]jf lrNnf]x? ko:0 (emulsify) jf nll; nf] cj:yfdf kl/0ft xG5g\ cdfzodf xg]nf0k}hx?sf]nflu cDnlo cj:yf tolt cgsh klg xG5 . t/ lzzx?df cdfzodf lrNnf]kbfx]sf]kfrg w}xb; Dd kefj sf/L xG5 lsgeg]lzzx?sf]cdfz0 tolt cDnlo cj:yfdf /xG5 / of]sl/a t6:y cj:yfdf g} /x\$]xG5 .

;fgf]cfGbl\df kfrg Mkfo;Ls/Of

lrNnf] kbfy{ jf af] fǫ? Itglx?sf] ; txl bj fj af6 dQm e0{ ; txl lfQkm a9ǫ hfBf ; fgf] ; fgf] yf]kfx?df kl/Of t xg] klqmfnf0{ ko:; Ls/Of elg65 . of] cj :yfdf lrNnf] kbfyǫ?sf] ; txsf] lfQkm a9ǫ hf65 . of]klqmf lrNnf]kbfyǫf]/fd]kfrgdf lgs}g} dxTj kǫ{x65 . ko:; Ls/Of klqmf tlg k/s klqmfxf?af6 dfq ; Dej x65 .

lkQsf]kl/dfhǫ lqmfnsnk

6lqmPsf] lrNnf] kbfy{ jf af] fǫf] ; txl bj fj sd ug] klqmf Vffgf gnldf xg] df÷kǫlx?sf]lg/6t/ vDrf0 / t6sf0 (Peristalsis) n]xg] ofl6qs ld; fj 6

!= lkQ njOf jf lkQ cDnx?

ol Unf0sf]f]ns (glycocholic) / 6p/f]f]ns (taurocholic) h:tf h]j s kl/dfhǫx? Xg\ hg sn]hfdf xg]sf]h]6]f]h x?af6 a6b5g\ . loglx? ko:; Ls/Of ug{lgs}g}k6fj sf/l h]j s tTj x? xg\ . ol kl/dfhǫx?n]lrNnf]jf af] f]oQm dl; gf kbfyǫ?; udf ; ÷uǫf ; fgf ; fgf s0fx? agfp5g\ -hg ko:; Ls/Of e0; sǫf yf]kfx? xg\ h; nf0{loglx?n] Ps cfk; df ldl; g lbbǫg\

@= 6lqmPsf af] fǫ?sf] ; txl bj fj sd ug]lqmfnsnk

6lqmPsf af] fǫ? jf kl/ldes af] fǫf] kfrgaf6 pTkflbt dfǫfP; f0n ll;]f]h h:tf :j t6q af] lo cDnx?n] ko:; Ls/Ofnf0{ a9fj lb65 . ol of]usx? / ; fy} km]km]nlk8x? ; txsf]bj fj sd ug]tTj x? (surfactant) xg\ . ol tTj x?df w] lo / cw] lo ; dǫx? X65g\ . loglx? kfgl / af] fǫf] ; uǫ :yndf 6fF; g ; S5g\h; sf] sf/0fn]ubf{af] lo yf]kfx?sf] ; txl lfQkm a9ǫ hf65 .

#= lkQ njOf / ; txl bj fj sd ug] tTj x?sf] lqmfnsnk afxǫ Vffgf gnldf xg] df÷kǫlx?sf]lg/6t/ vDrf0 / t6sf0 (Peristalsis) n] xg] ofl6qs ld; fj 6 klg af] fǫ?sf]ko:; Ls/Ofdf ; xof]u kǫofp65 . ; fgf ; fgf ?kdf agǫf o:tf af] lo yf]kfx? eg]/fd/l kRg ; Sg]tTj x? xg\

kfrg yǫlaf6 pQkflbt ; fj jf 0Ghf0dx?ǫf/f af] fǫf]kfrg

vfgdf kf0g]6ǫP; f0n ll;]f]h, sf]h]6]f]h 0:6/ / km]km]nlk8x?sf]kfrgsf]lgldt kfrg yǫlaf6 lgisfzg xg] ; fj jf 0Ghf0dx? sf/s tTj sf]?kdf /xǫf x65g\

!= 6ǫP; f0n ll;]f]h jf af] fǫf]kfrg

kfrg yǫlaf6 pTkflbt nf0k]h 0Ghf0d vfB kbfyǫf kf0g] af] fǫ?sf] lgldt kǫv pTk]s xf] . ol 0Ghf0dx?n]6ǫP; f0n ll;]f]h h:tf] af] lo cDnsf]c0fsf]klxnf]/

t] f]:yfgdf 6bmf0{dfgfp; f0n llun; }fjh (2-monoacyl glycerol) / :j tGq Pldgf]cDnx?
agfpb5g\ tyflk lkQ cDnx?n]nf0k]hx?sf]sfohf0{lgliqmo tNofpg vflb5 . t/
klg lkQ y]ln]k]f ug]; xnf0k]h (colipase) n]; f]cDnx?sf]sfohf0{lg/fs/of u/L ; f]
cj:yfaf6 kf/ lbnfpb5 .

af]; o nf0k]hx?n]dfgfp; f0n llun; }fjh, sfjh:6}f0n 0:6/, le6fldg 0:6/ cflbdf sfo{
u/L Itglx?nf0{6bmfP/ :j tGq af] lo cDnx? k]f ub5g\ t/ of]sfo{f]lgldQ lkQ
cDn cfjZos xG5 .

@= sfjh]6}fjh 0:6/x?sf]6bmf0

kfrg y]laf6 lgl:sg] sfjh:6}fjh 0:6/h -sfjh:6}fjh 0:6/ xf08]h_n] sfjh]6}fjh
0:6/nf0{6bmfP/ sfjh:6}fjh / :j tGq af] lo cDnx? lbG5g\

#= knf]knf]nk8x?sf]6bmf0

knf]knf]nk8x?nf0{6bmfpg knf]knf]f0k]h]k]v eldsf vflb5 . lkQ y]laf6 lgl:sg]
; lj knf]knf]f0k]h P@ (phospholipase A2) n] oQm xG5 h; nf0{l6k; gn]pQ]ht
kfb5 h; n]af] lo cDnx?sf]c0fx?sf]bf] f]:yfgdf 6bmfpb5 / :j tGq af] lo cDnx?
tyf nf0; f]knf]knf]nk8x?sf]pTkfbg xG5 .

lrNnf]j f af] f]x?sf]cj zflf0f

Former (lj ut) and present (xfnsf] theory for absorption of lipid (af] f]x?sf]cj zflf0fsf]
lj ut / xfnsf]l; 4fGt)

!=e]hf/áf/f k]tkflbt nf0k]f]f0l6ssf]l; 4fGt

of]l; 4fGt cg' f/ af] f]x? k]f{?kdf hnlo ljR5]bg e0{llun; }fjh / :j tGq af] lo
cDnx? ag5g\ o; /L pTkflbt llun; }fjh / :j tGq af] lo cDnx? af]; o cDnsf]nj0fsf]
?kdf j f lkQsf]nj0fsf]; #u]f cj zfl]ft xG5g\

@=lj efhg (Partition) knf]h/áf/f k]tkflbt lj efhgsf]l; 4fGt

of]l; 4fGt cg' f/ 6kP; f0n llun; }fjhsf]kfrg d]zsf dfq xG5 . ol cflzsf?kdf
kr\$]f 6kP; f0n llun; }fjhx? lkQ nj0fsf]; #u]f k/] ko:o e0{n; kb5g\ . ol
lrNnf]x?nf0{cfGbfdf xg] cfR5fbs sf]fx?n]; f]g ; Sb5 . To; h] of] k]lqmfdf /Qm
; #f/ k]f]nldf hfg lrNnf]j f af] f]x?sf]k]g]lgdf]f h?/L xG5g .

#=a]f]6]dsf]l; 4fGt

of]l; 4fGt g]hf] / ca dffemPsf]l; 4fGt xf] h; n] klxn\$]f k]fom ; a}l; 4fGtx?nf0{
jlxisf/ ul/lbof]. of]l; 4fGt cg' f/ k]f]ylds ?kdf dfgfp; f0n llun; }fjh, :j tGq af] lo
cDn tyf :j tGq sfjh:6}fjhsf]pTkfbg xG5 . lkQ nj0fn]af] f] # ldl>t ko:o yf]kfx?

agfpb5g\ . ol ko:o yf|kfx? uf|hf] 8Nnf] cfsf/sf] xG5 h; sf] leq k\$|sf] efudf
df|gfP; f0N lUn; 7f|h, :j tGq af] lo cDnx?, :j tGq sf|h]67f|h tyf kmf]kmf]nlk8x?
xG5g\eg] ; txdf lkQ nj 0fx? xG5g\ . kfglsf] ; #uGf cfpG rfxg] jf hn lk0
(hydrophilic) wj|lo ; d|x? aflx/ tkm|lgb|z t xG5g\eg]kfglsf] ; #uGf cfpG grfxg]
(hydrophobic) cw|lo ; d|x? leq tkm|lgb|6 xG5g\ . of]cj :yfdf lkQ nj 0fx?sf]
ko:o y|lx? Jff yf|kfx?n]af] f]j f lrNnf]kbfy\$]3hgZln cj :yfnf0{a9fj f lbG5 .

Af] f\$]cj zff]0f klqnof

ldl>t ko:o yf|kfx?n]cfGb|sf]gnlaf6 sf]fx?; Dd af] fhf0{nfgsf]nflu j fxssf]sfd
ub5 hxfFol af] fx? cj zff]ift xG5g\ . af] fx? Jofkgsf]df|Wodaf6 cj zff]ift xG5g\
h; af/f xNsf kfgldf 3hgZln dfgfP; f0n lUn; 7f|h? / :j tGq af] lo cDnx?
kN?kdf cj zff]ift xG5g\eg]c3gnzln af] fx? ckN{?kdf cj zff]ift xG5g\ . tl
j fx\$] af] f0f 3hgZln le6fldg P / S) (vitamin A and K) sf]lgldt klG ol ko:o
yf|kfx? cfjZos xG5g\ . tyflk, af] fx?sf]cj zff]0fsf]b/ lkQ nj 0fsf]dfqdf e/
kb5 .

> gf0M ; fgj] -\$ eGbf sd >P\vnfsf] / d|Wod -\$!@ >P\vnf ePsf] af] lo
cDnx? cj zff]0fsf]lgldQ lgdf0f{xg]ko:o yf|kfx?df e/ kb5g\

cfGb|sf]sf]fx?af6 af] f]j f lrNnf]?sf]lgisfzg

yfof\$foGh gfdS 0Ghf0dsf]df|Wodaf6 cfGb|sf]gnldf af] fx? -:j tGq af] lo cDnx?,
af] f\$] ?kdf, sf|h]67f|h sf|h]67f|h 0:6/sf] ?kdf / nf0; f|kmf]kmf]nlk8x?
kmf]kmf]nlk8sf]?kdf_ sf]kblgGdf0f xG5g\ o; /L lgdf0f ePsf]af] fx? kfglsf] ; #uGf
cfpG grfxg]kj [tsf xG5g\hg af] lo yf|kfx?sf]?kdf hDdf xG5gV Pkf]nkfk]6gx?
(apop) / kmf]kmf]nlk8x?sf] kftnf] txn] a|Psf] xG5 . o; nf0{ sf0nf0f0qmfG
(chylomicron) elG5 .

; fef/ ; f|x?M

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- 2. digestive.niddk.nih.gov/ddiseases/pubs/yrdd/
- 3. *Biochemistry by U. Satyanarayan*

- szn >]7 / gjlg gf/fo0f dg\$dl{