



11. *Transverse dial swelling*: Fractional increase in diameter of a fiber after swelling is called transverse dia swelling.

Mathematically,

Transverse dia swelling, SD = ∆D / D

Where, D = original diameter of fiber,

∆D =increased diameter of swollen fiber.

2. *Transverse area swelling*: Fractional increase in area of a fiber after swelling is called transverse area swelling.

Mathematically,

Transverse area swelling, SA = ∆A / A

Where, A = original area of fiber,

 ∆A =increased area of swollen fiber.

3. *Axial swelling*: Fractional increase in length of a fiber after swelling is called axial swelling.

Mathematically, Axial swelling, SL = ∆L / L

Where, A = original length of fiber,

∆L =increased length of swollen fiber.

4. *Volume swelling*: Fractional increase in volume of a fiber after swelling is called volume swelling.

Mathematically,

Volume swelling, SV = ∆V / V

Where, V = original Volume of fiber,

∆V =increased volume of swollen fiber.

*Relation between SA & SD*:

 We know that,

Transverse area swelling, SA = ∆A / A

Transverse dia swelling, SD = ∆D / D

 For a circular fiber, area A = (π/4)D2

 For a swollen fiber, we get, A+∆A = (π/4)(D+∆D)

 = (π/4)(D2 + 2D. ∆D + ∆D2)

Now,

SA = ∆A / A

= (A+∆A-A) */* A

= {(π/4) (D2 + 2D. ∆D + ∆D2) - (π/4) D2}*/* (π/4) D2

= (π/4) (D2 + 2D. ∆D + ∆D2 - D2) */* (π/4) D2

= (2D. ∆D + ∆D2) / D2

= (2D. ∆D / D2) + (∆D2/ D2)

= 2(∆D / D) + (∆D2/ D2)

= 2 SD + SD2

So, SA = 2 SD + SD2.

*Relation among SA ,SV & SL*:

We know that,

Transverse area swelling, SA = ∆A / A

 Volume swelling, SV = ∆V / V

 Axial swelling, SL = ∆L / L

For a circular fiber, volume, V=AL

For a swollen fiber, we get, V +∆V = (A +∆A )(L +∆L)

 = AL + A∆L + ∆AL + ∆A ∆L

Now, SV = ∆V / V

=(V+ ∆V - V) / V

=( AL + A∆L + ∆AL + ∆A ∆L - AL)/AL

= ∆L / L+ ∆A/ A + ∆A/ A. ∆L / L

= SL + SA + SL. SA

So, SV = SL + SA + SL. SA.