### GROUP A: NEEDLE DISCOLOUROUS, outer surface without stomata lines (LENS)

- **All lateral shoots pendulous. Needles often 25-35 mm.**  ➔ *P. breweriana*  ➔ *P. spinulosa*

- **Lateral shoots spreading to pendulous in part, OR needles predominantly ≤25 mm.**
  - Leafy lateral shoot predominantly long and slender: L/W ≥4/1.  ➔ *P. brachytyla*  ➔ *P. farreri*
  - Leafy lateral shoot predominantly short and wide: L/W ≤4/1.
  - Shoot pubescent.  ➔ Needle Ø flattened, few stomata.  ➔ *P. omorika*
  - Shoot glabrous.  ➔ Needle Ø rhombic-quadrangular, many stomata.  ➔ *P. likiangensis*

### GROUP A: NEEDLE DISCOLOUROUS, outer surface with 1-4 stomata lines (LENS)

- Needle long, predominantly (15-)20-35 mm.
  - Shoot pendulous. Needles all pointing forward.  ➔ *P. spinulosa*
  - Shoot spreading/pendulous. Needles forward + sideward.
  - Shoot glabrous, needle pungent.  ➔ *P. sitchensis*
  - Shoot pubescent, needle not pungent.  ➔ Needle Ø flattened, few stomata.  ➔ *P. omorika*
  - Shoot glabrous, needle pungent.  ➔ *P. sitchensis*
  - Shoot pubescent, needle not pungent.  ➔ Needle Ø rhombic/quadrangular, many stomata.  ➔ *P. likiangensis*

- Needle short, predominantly 8-15 mm.
  - Needles above shoot imbricate.  ➔ *P. purpurea*
  - Needles above shoot raised.
  - End bud not resinous, basal scales acicular.  ➔ Needle slender, Ø ≤0,8 mm.  ➔ *P. mariana*
  - End bud resinous (basal scales triangular).  ➔ Pulvini small: 0,5 mm.  ➔ *P. alcoquiana*
  - Needle Ø 1-1,5 mm.  ➔ *P. glehnii*
  - Pulvini larger: 1-1,5 mm.  ➔ *P. likiangensis*
**GROUP B: NEEDLE CONCOLOUROUS, SHORT: predominantly ≤15(-17) mm.**

► Needle short, length rather constant. → *P. orientalis*

► Needle length more variable.

  ▶ Current year shoot GLABROUS.

    ▶ Needles above shoot +/- appressed to slightly raised. → *P. morrisonicola*

    ▶ Needles above shoot at least in part +/- strongly raised to assurgent on strong shoots.

      □ Needles above shoot at least in part +/- strongly raised.

      ▪ Needle Ø +/- flattened AND extremely sharp painfully pungent. → *P. chihuahuana* → *P. martinezii*

      ▪ Needle Ø rhombic to quadrangular (roll between fingers).


      ▪ Needle Ø commissural, not flattened. → *P. engelmannii*

      ▪ Needle Ø 1-2 mm. Needles below shoot directed sideward to forward, not pungent. → *P. wilsonii*

      ▪ Shoot stout Ø 2-4 mm. Needles below shoot directed rather forward, often pungent. → *P. schrenkiana*

► Needles above shoot at least in part assurgent. Bud resinous. → *P. koyamae*

► Shoot +/- pendulous. All needles directed forward AND 25-50 × 1 mm. → *P. smithiana*

► Shoot spreading, OR needles partly directed sideward, OR needle ≤35 × 1-1,5(-2) mm.

  ▶ Shoot slender, Ø +/- 2 mm. Needles below shoot directed sideward to forward, not pungent. → *P. wilsonii*  Shoot stout Ø 2-4 mm. Needles below shoot directed rather forward, often pungent. → *P. schrenkiana*

  ▶ Shoot/YELLOW TO BROWN or at least so the second year.

  ▶ Needles not pungent. → *P. abies* → *P. engelmannii*

  ▶ Needles pungent.

**GROUP B: NEEDLE CONCOLOUROUS, LONG: predominantly 15-25(-more) mm.**

► Shoot +/ pendulous. All needles directed forward AND 25-50 × 1 mm. → *P. smithiana*

► Shoot spreading, OR needles partly directed sideward, OR needle ≤35 × 1-1,5(-2) mm.

  ▶ Shoot/YELLOW TO BROWN or at least so the second year.

  ▶ Needles not pungent. → *P. abies* → *P. engelmannii*

  ▶ Needles pungent.

  ▶ Needle Ø +/- flattened AND extremely sharp painfully pungent. → *P. chihuahuana* → *P. martinezii*

  ▶ Needle Ø rhombic to quadrangular (roll between fingers).