

- A: CuCl₂·2H₂O
 - B: NiSO₄·6H₂O
 - C: CoCl₂·6H₂O
 - D: MgSO₄·7H₂O
 - E: NiCl₂·6H₂O
 - F: H₃BO₃
 - G: ZnCl₂
 - H: MnSO₄·7H₂O
 - J: KI
 - K: MnCl₂·4H₂O
 - L: FeSO₄·7H₂O
 - M: Na₂MoO₄·2H₂O
 - N: FeCl₃·6H₂O
 - O: KNO₃
 - P: NaCl
 - Q: Glucose
 - R: Fructose
 - S: Yeast extract
 - T: (NH₄)₂SO₄
 - U: KH₂PO₄
 - V: K₂HPO₄
 - W: Vitamine B1
 - X: BaCl₂·2H₂O
- Positive Effects
■ Negative Effects

Pareto Chart

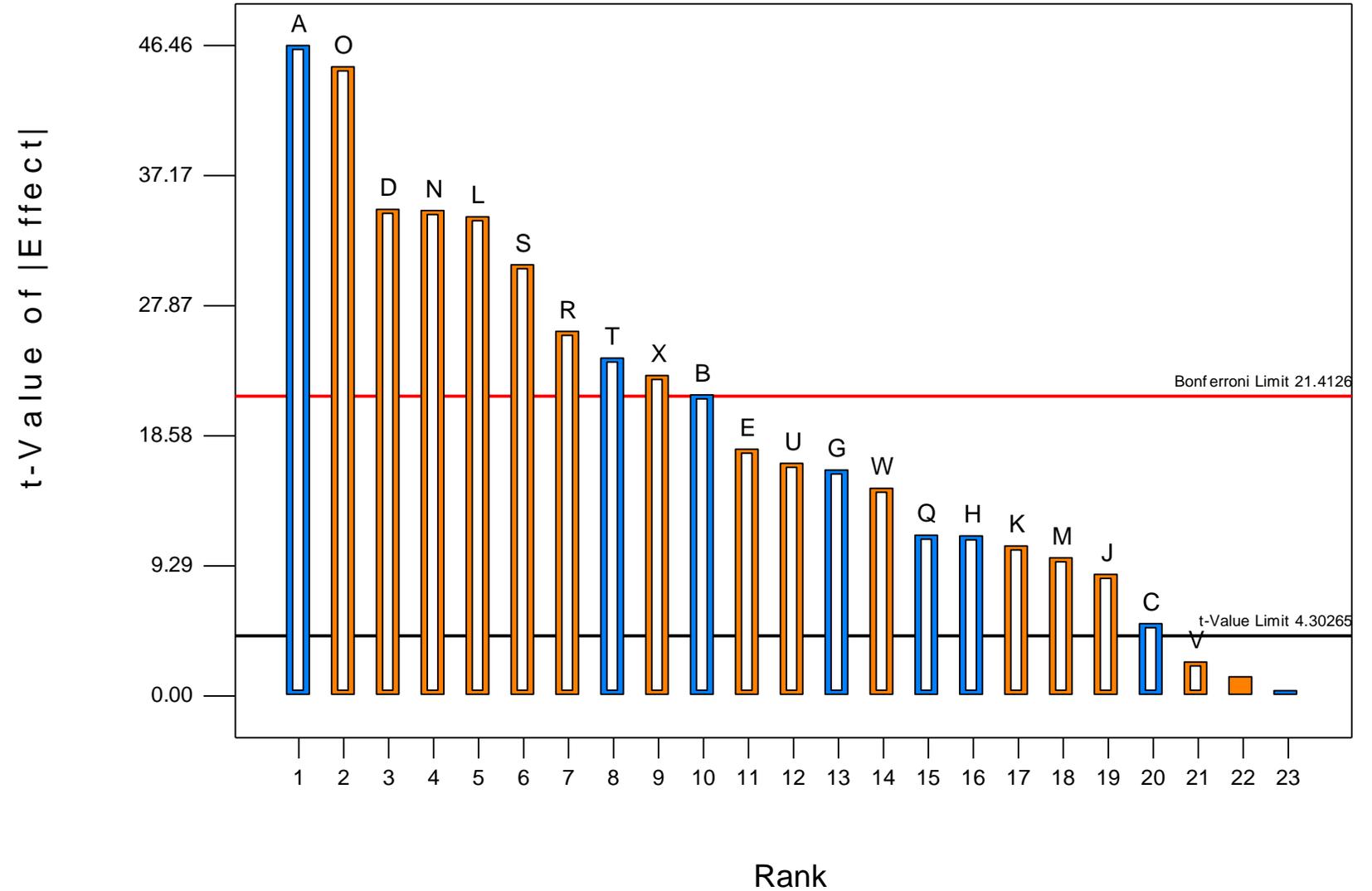


Fig S1: Pareto chart of the effects of chemical compounds selected according literature and preliminary experiments on biomass production by the engineered strain Po1f-1312E+1269IB

- A: CuCl₂·2H₂O
- B: NiSO₄·6H₂O
- C: CoCl₂·6H₂O
- D: MgSO₄·7H₂O
- E: NiCl₂·6H₂O
- F: H₃BO₃
- G: ZnCl₂
- H: MnSO₄·7H₂O
- J: KI
- K: MnCl₂·4H₂O
- L: FeSO₄·7H₂O
- M: Na₂MoO₄·2H₂O
- N: FeCl₃·6H₂O
- O: KNO₃
- P: NaCl
- Q: Glucose
- R: Fructose
- S: Yeast extract
- T: (NH₄)₂SO₄
- U: KH₂PO₄
- V: K₂HPO₄
- W: Vitamine B1
- X: BaCl₂·2H₂O
- Positive Effects
- Negative Effects

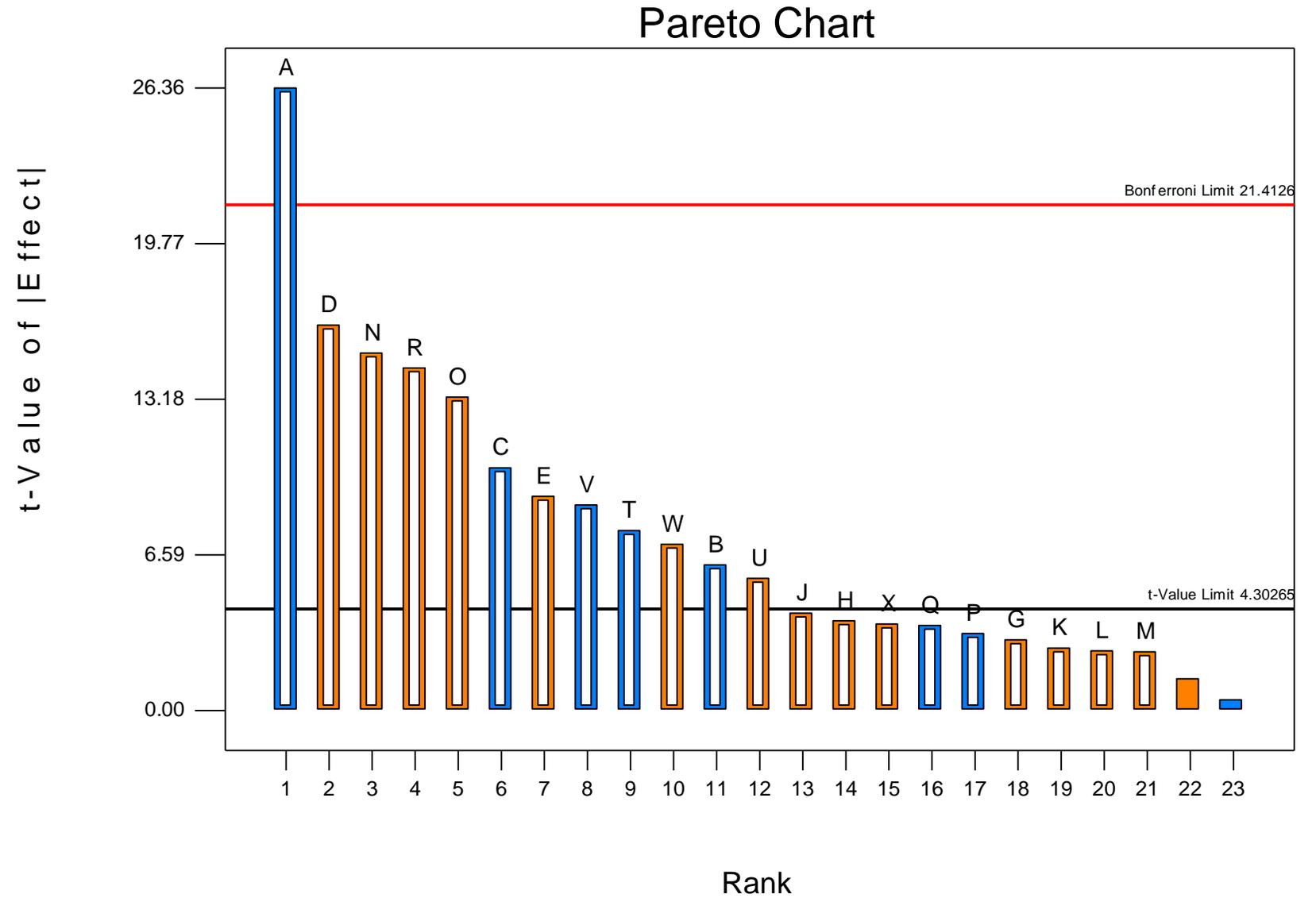


Fig S2: Pareto chart of the effects of chemical compounds selected according literature and preliminary experiments on lycopene production by the engineered strain Po1f-1312E+1269IB

- A: CuCl₂·2H₂O
- B: NiSO₄·6H₂O
- C: CoCl₂·6H₂O
- D: MgSO₄·7H₂O
- E: NiCl₂·6H₂O
- F: H₃BO₃
- G: ZnCl₂
- H: MnSO₄·7H₂O
- J: KI
- K: MnCl₂·4H₂O
- L: FeSO₄·7H₂O
- M: Na₂MoO₄·2H₂O
- N: FeCl₃·6H₂O
- O: KNO₃
- P: NaCl
- Q: Glucose
- R: Fructose
- S: Yeast extract
- T: (NH₄)₂SO₄
- U: KH₂PO₄
- V: K₂HPO₄
- W: Vitamine B1
- X: BaCl₂·2H₂O
- Positive Effects
- Negative Effects

Pareto Chart

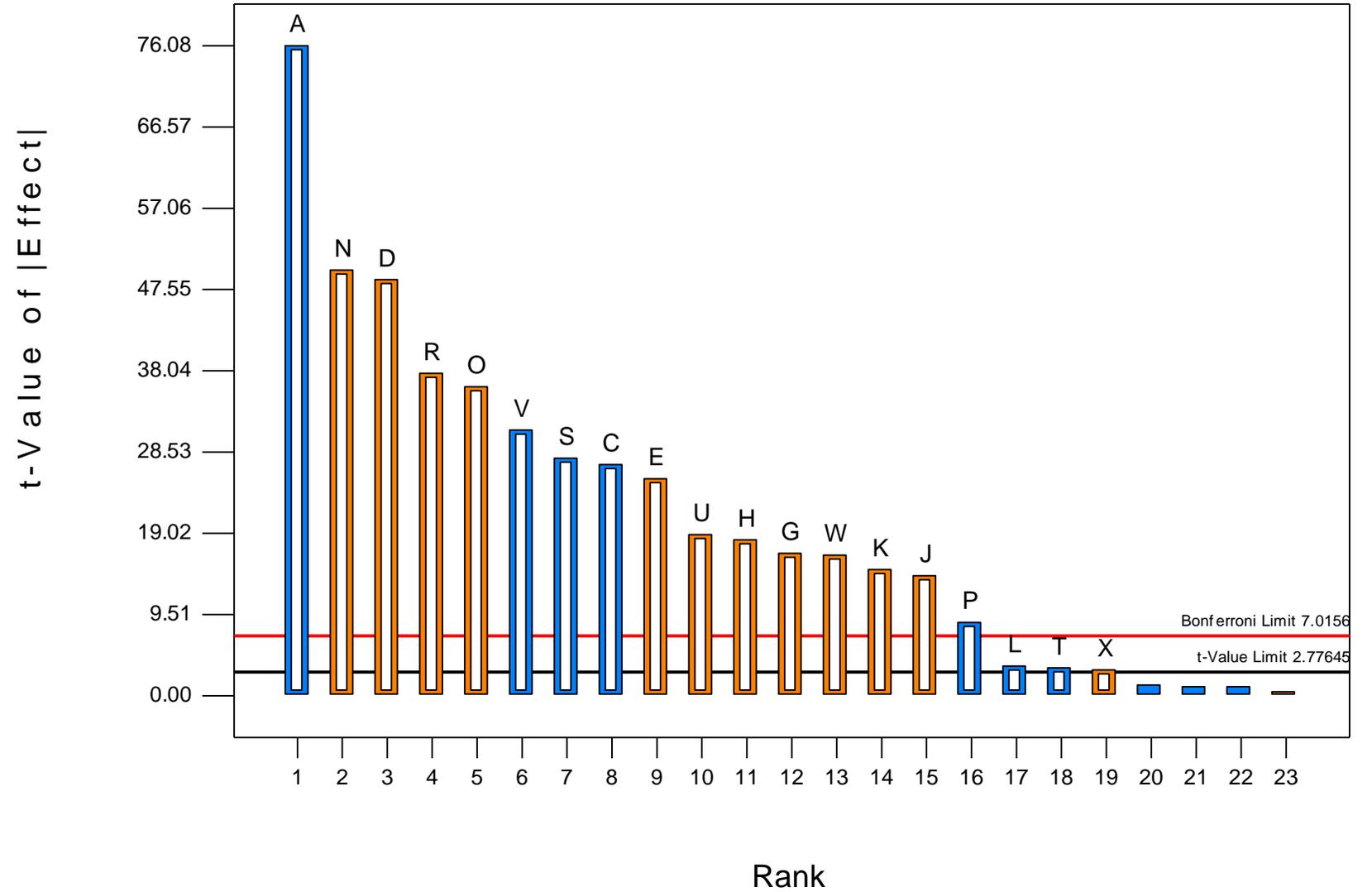


Fig S3: Pareto chart of the effects of chemical compounds selected according literature and preliminary experiments on lycopene content of the engineered strain Po1f-1312E+1269IB

- A: Thiamine pyrophosphate
- B: Pyridoxine, hydrochloride
- C: nicotinate
- D: Succinate
- E: 4 Aminobutyric acid
- F: KH₂PO₄
- G: (NH₄)₂SO₄
- H: Urea
- J: Sulfite Na₂SO₃
- K: Ergosterol
- L: Ethanolamine
- M: Hypoxanthine
- N: Guanine
- O: L Histidine
- P: L Methionine
- Q: L Lysine
- R: L Tryptophan
- S: L Valine
- T: L Asparagine
- U: L isoleucine
- V: L Leucine
- W: D glucose
- X: D Fructose
- Positive Effects
- Negative Effects

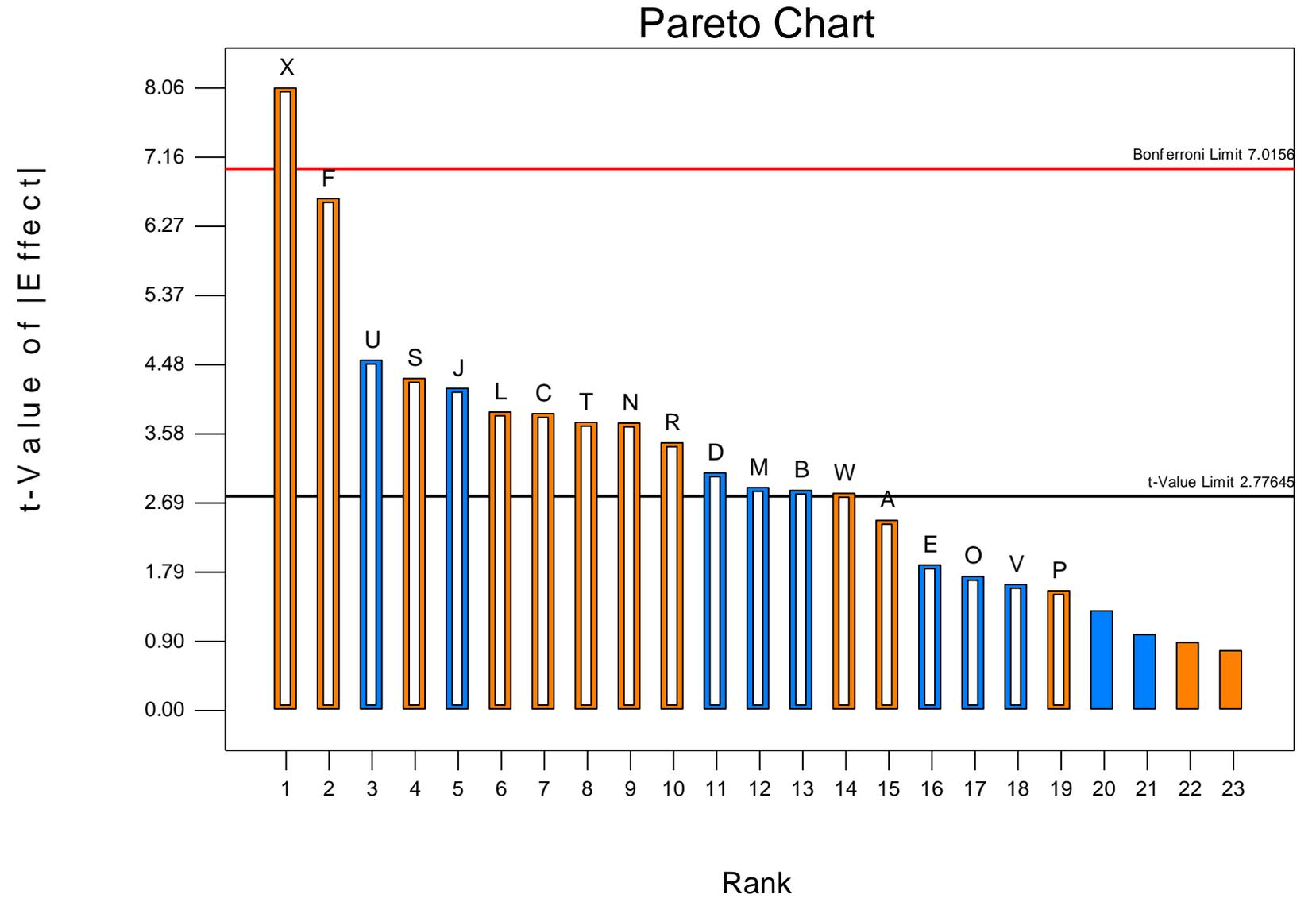


Fig S4: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on biomass production by the engineered strain Po1f-1312E+1269IB

- A: Thiamine pyrophosphate
- B: Pyridoxine, hydrochloride
- C: nicotinate
- D: Succinate
- E: 4 Aminobutyric acid
- F: KH₂PO₄
- G: (NH₄)₂SO₄
- H: Urea
- J: Sulfite Na₂SO₃
- K: Ergosterol
- L: Ethanolamine
- M: Hypoxanthine
- N: Guanine
- O: L Histidine
- P: L Methionine
- Q: L Lysine
- R: L Tryptophan
- S: L Valine
- T: L Asparagine
- U: L isoleucine
- V: L Leucine
- W: D glucose
- X: D Fructose
- Positive Effects
- Negative Effects

Pareto Chart

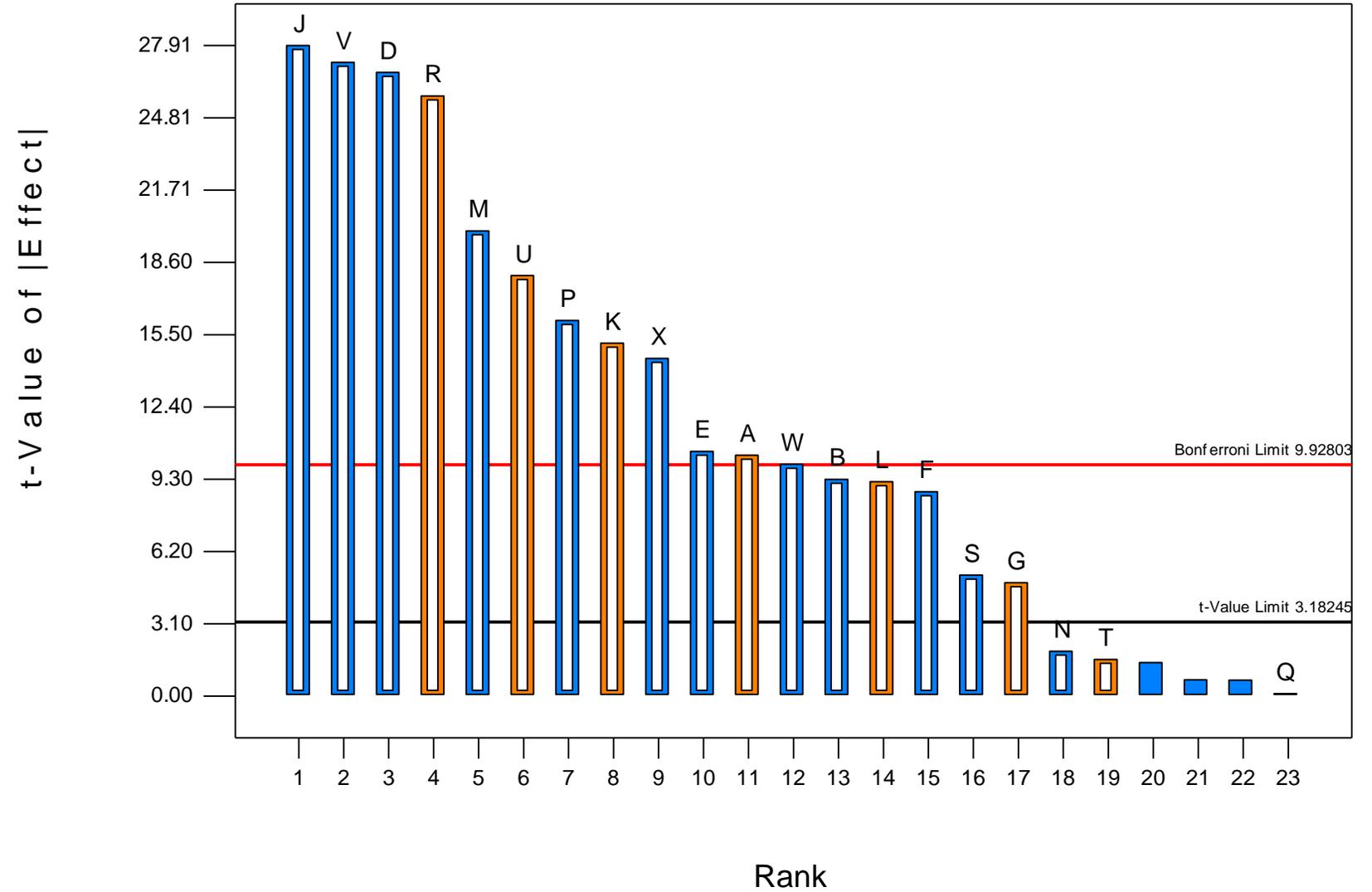


Fig S5: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on lycopene production by the engineered strain Po1f-1312E+1269IB

- A: Thiamine pyrophosphate
- B: Pyridoxine, hydrochloride
- C: nicotinate
- D: Succinate
- E: 4 Aminobutyric acid
- F: KH₂PO₄
- G: (NH₄)₂SO₄
- H: Urea
- J: Sulfite Na₂SO₃
- K: Ergosterol
- L: Ethanolamine
- M: Hypoxanthine
- N: Guanine
- O: L Histidine
- P: L Methionine
- Q: L Lysine
- R: L Tryptophan
- S: L Valine
- T: L Asparagine
- U: L isoleucine
- V: L Leucine
- W: D glucose
- X: D Fructose
- Positive Effects
- Negative Effects

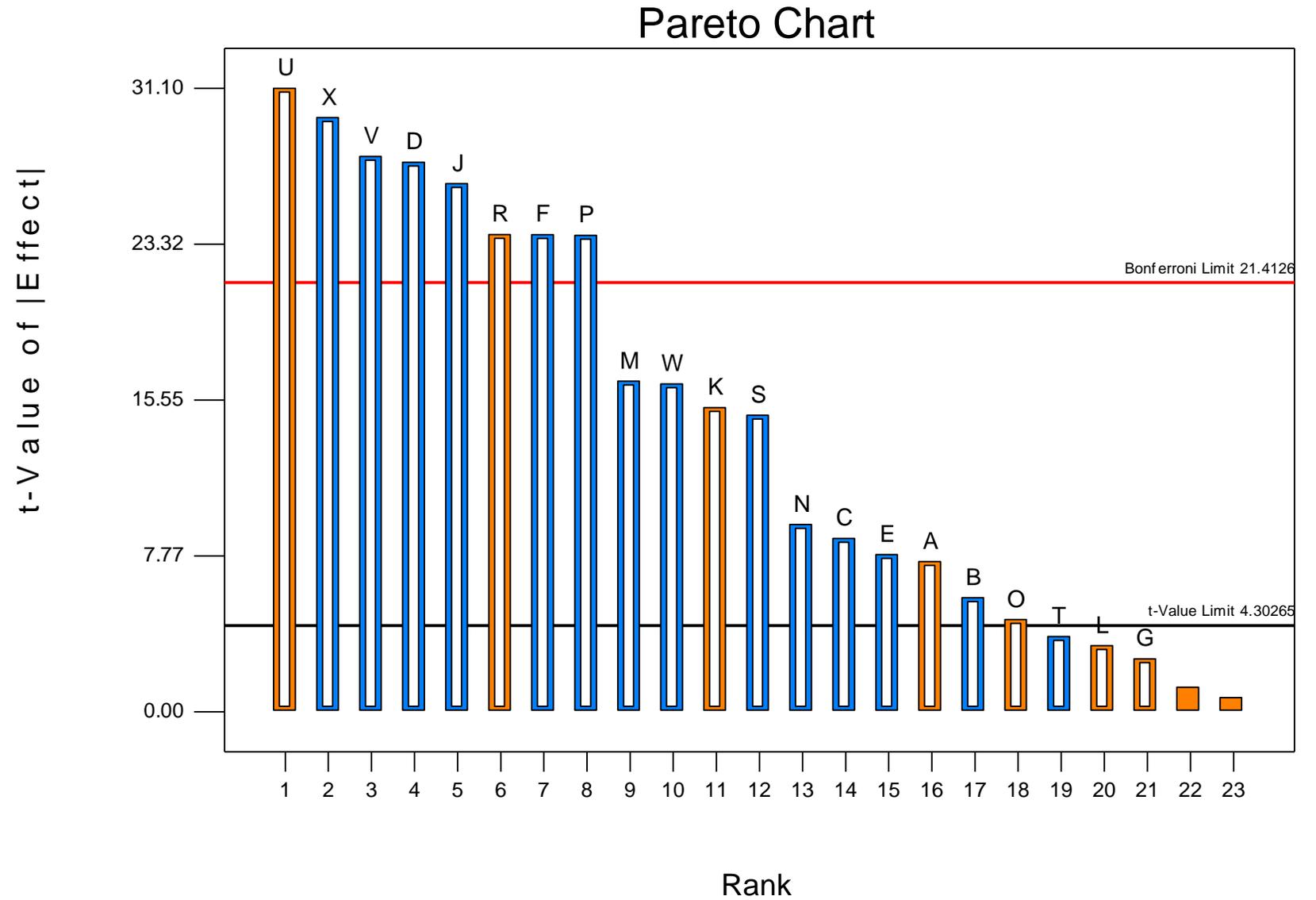


Fig S6: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on lycopene content of the engineered strain Po1f-1312E+1269IB

- A: Thiamine pyrophosphate
- B: Pyridoxine, hydrochloride
- C: nicotinate
- D: Succinate
- E: 4 Aminobutyric acid
- F: KH₂PO₄
- G: (NH₄)₂SO₄
- H: Urea
- J: Sulfite Na₂SO₃
- K: Ergosterol
- L: Ethanolamine
- M: Hypoxanthine
- N: Guanine
- O: L Histidine
- P: L Methionine
- Q: L Lysine
- R: L Tryptophan
- S: L Valine
- T: L Asparagine
- U: L isoleucine
- V: L Leucine
- W: D glucose
- X: D Fructose
- Positive Effects
- Negative Effects

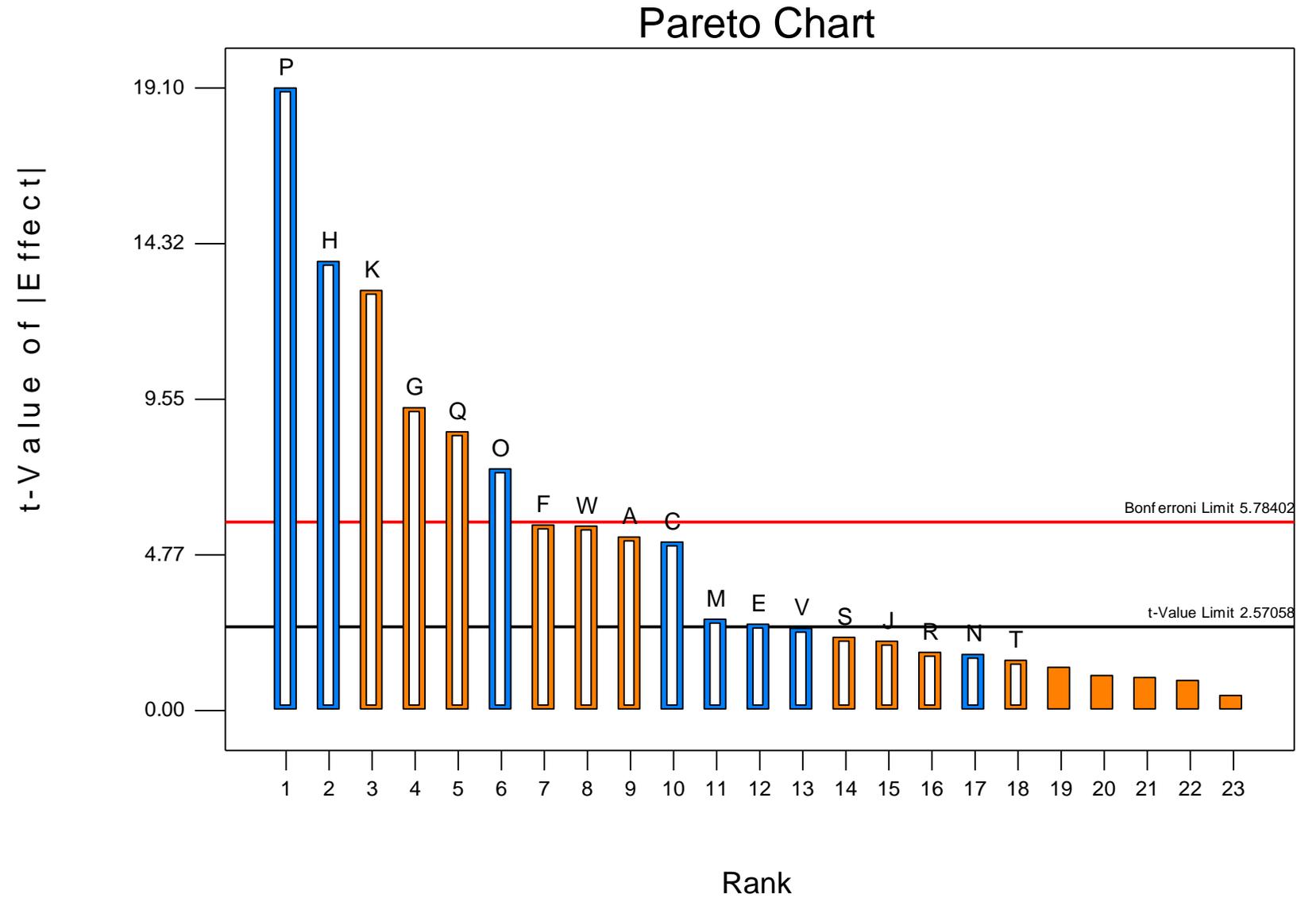


Fig S7: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on lipid production by the engineered strain Po1f-1312E+1269IB

- A: Thiamine pyrophosphate
- B: Pyridoxine, hydrochloride
- C: nicotinate
- D: Succinate
- E: 4 Aminobutyric acid
- F: KH₂PO₄
- G: (NH₄)₂SO₄
- H: Urea
- J: Sulfite Na₂SO₃
- K: Ergosterol
- L: Ethanolamine
- M: Hypoxanthine
- N: Guanine
- O: L Histidine
- P: L Methionine
- Q: L Lysine
- R: L Tryptophan
- S: L Valine
- T: L Asparagine
- U: L isoleucine
- V: L Leucine
- W: D glucose
- X: D Fructose
- Positive Effects
- Negative Effects

Pareto Chart

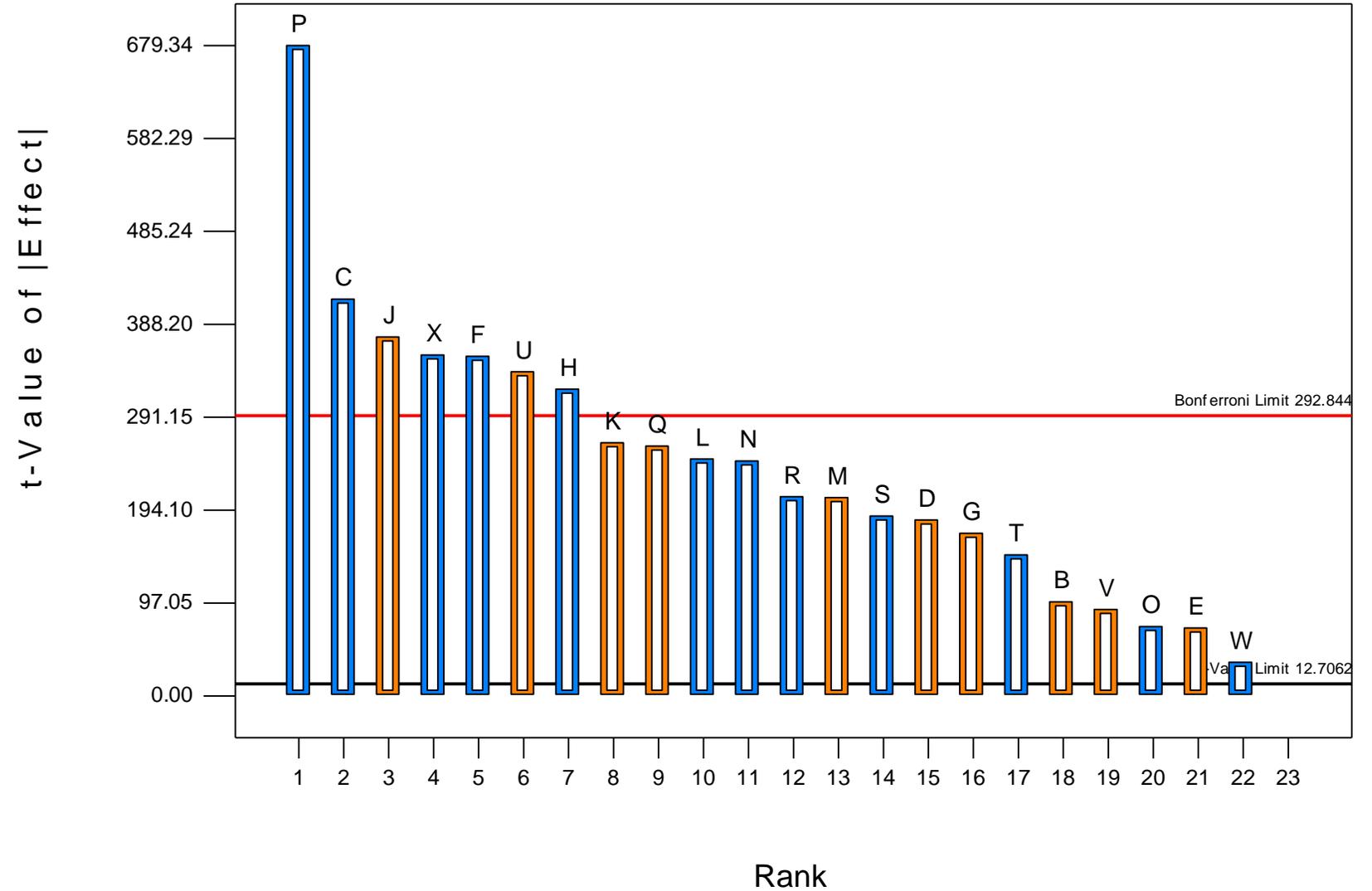


Fig S8: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on lipid content of the engineered strain Po1f-1312E+1269IB

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

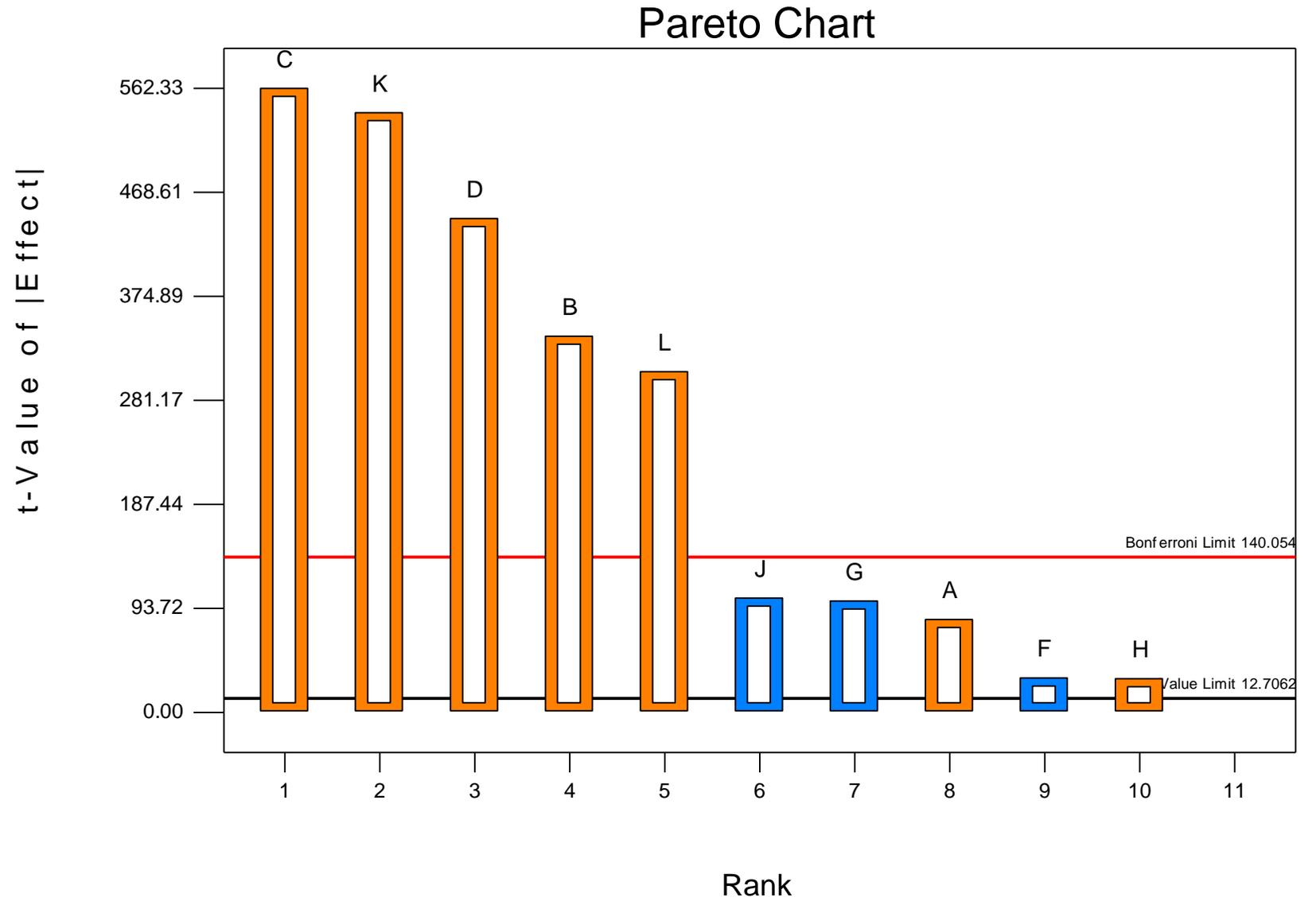


Fig S9: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on Biomass production by the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

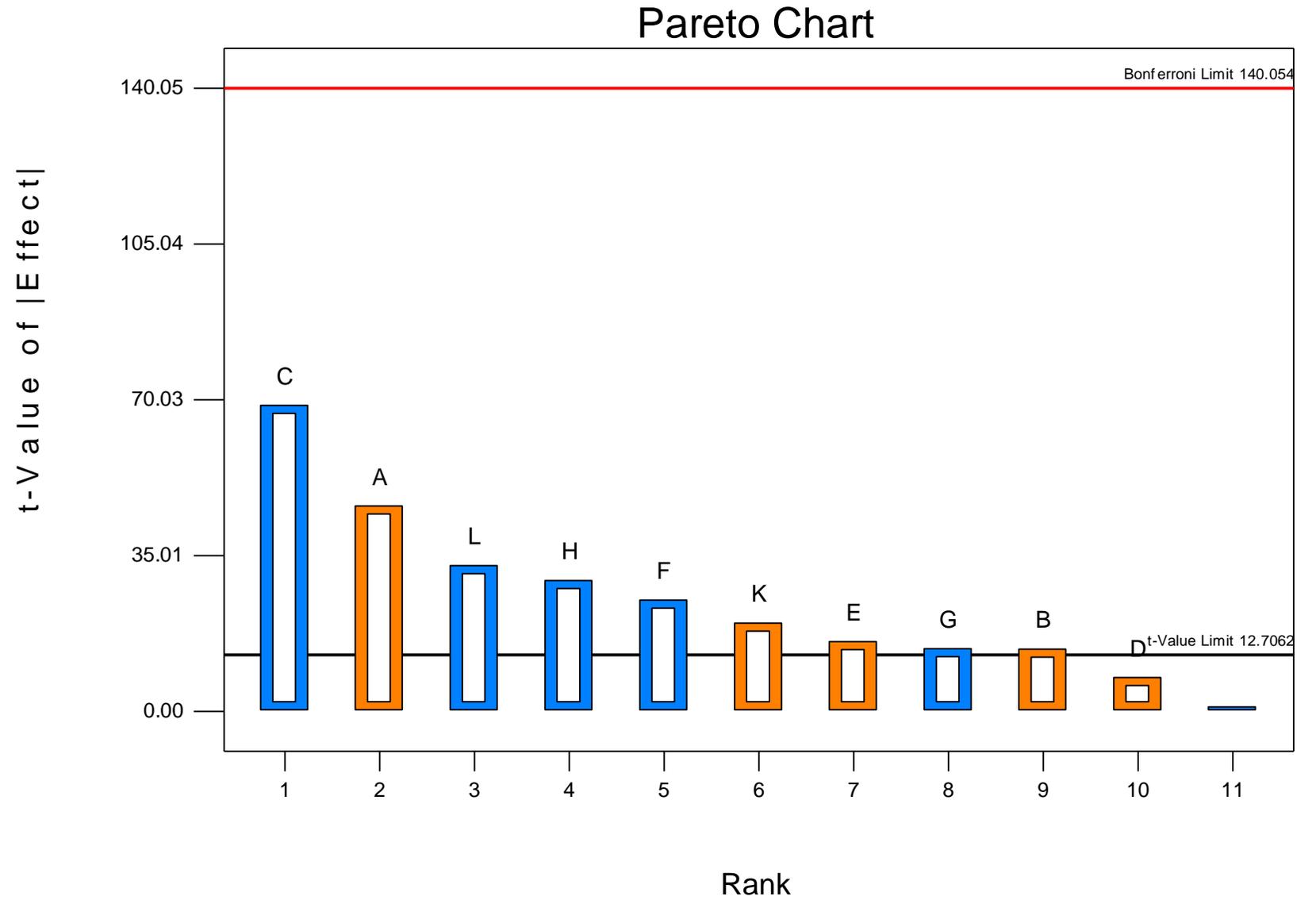


Fig S10: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on lycopene production of the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

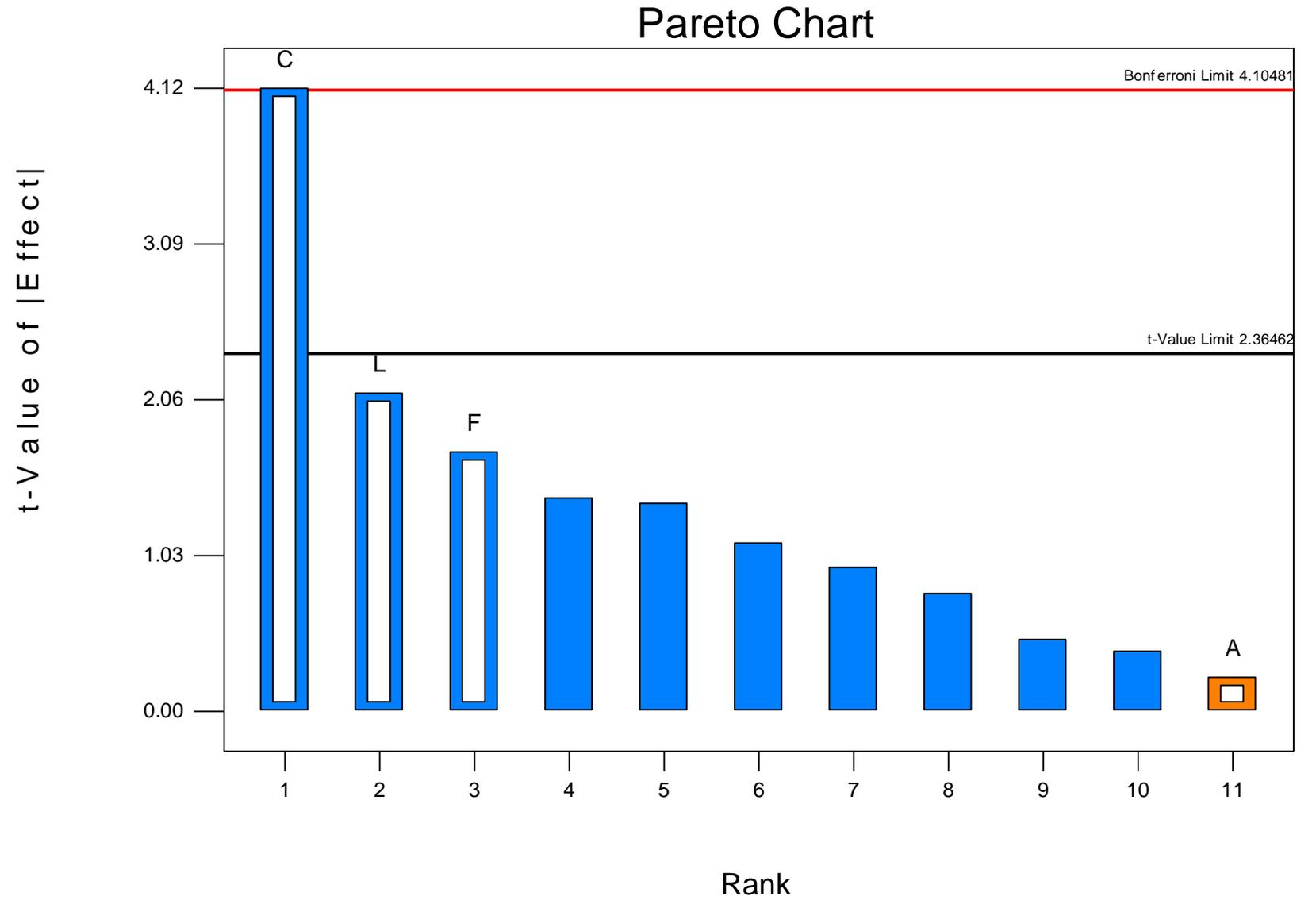


Fig S11: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on lycopene content of the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

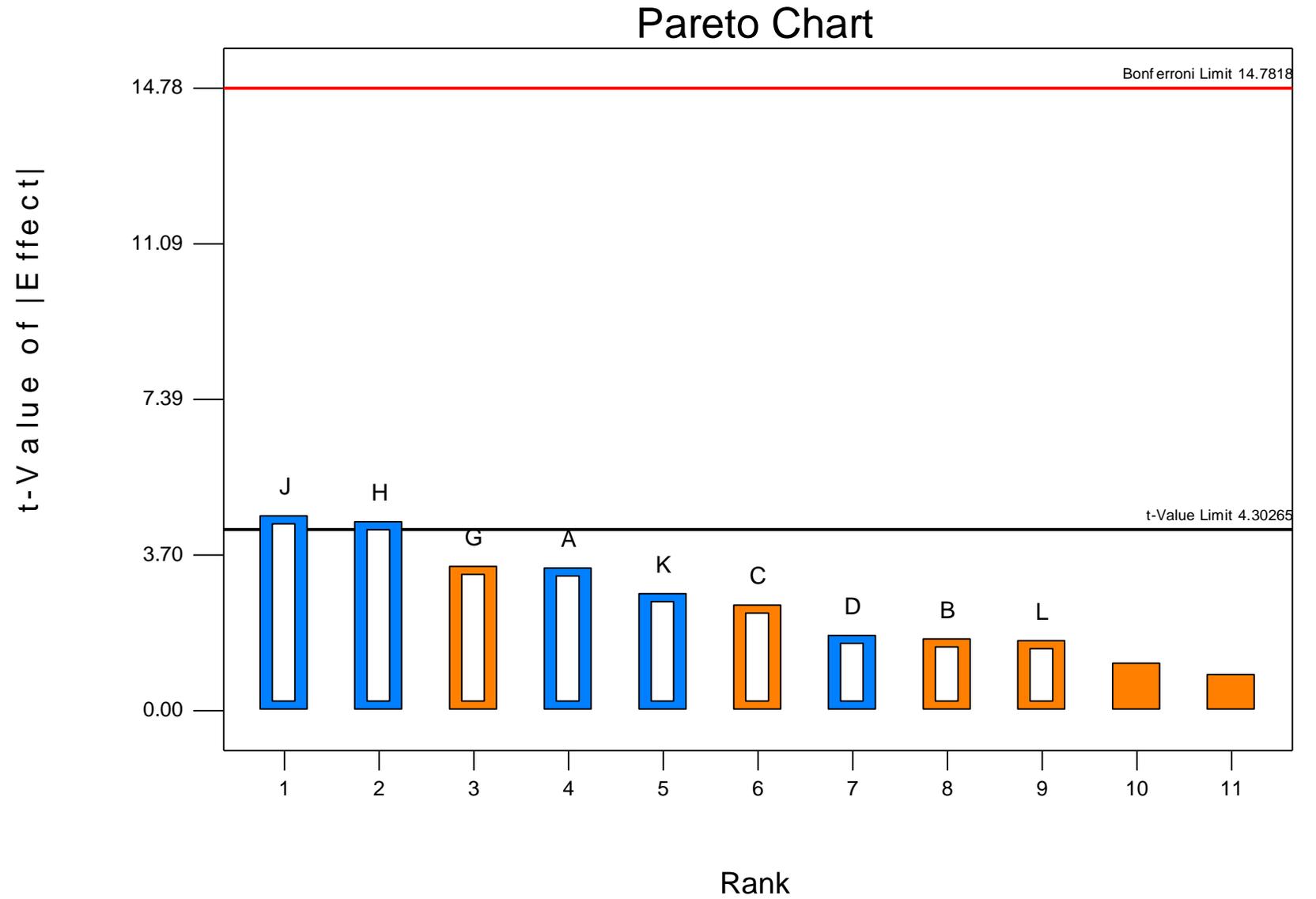


Fig S12: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0B08536g in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

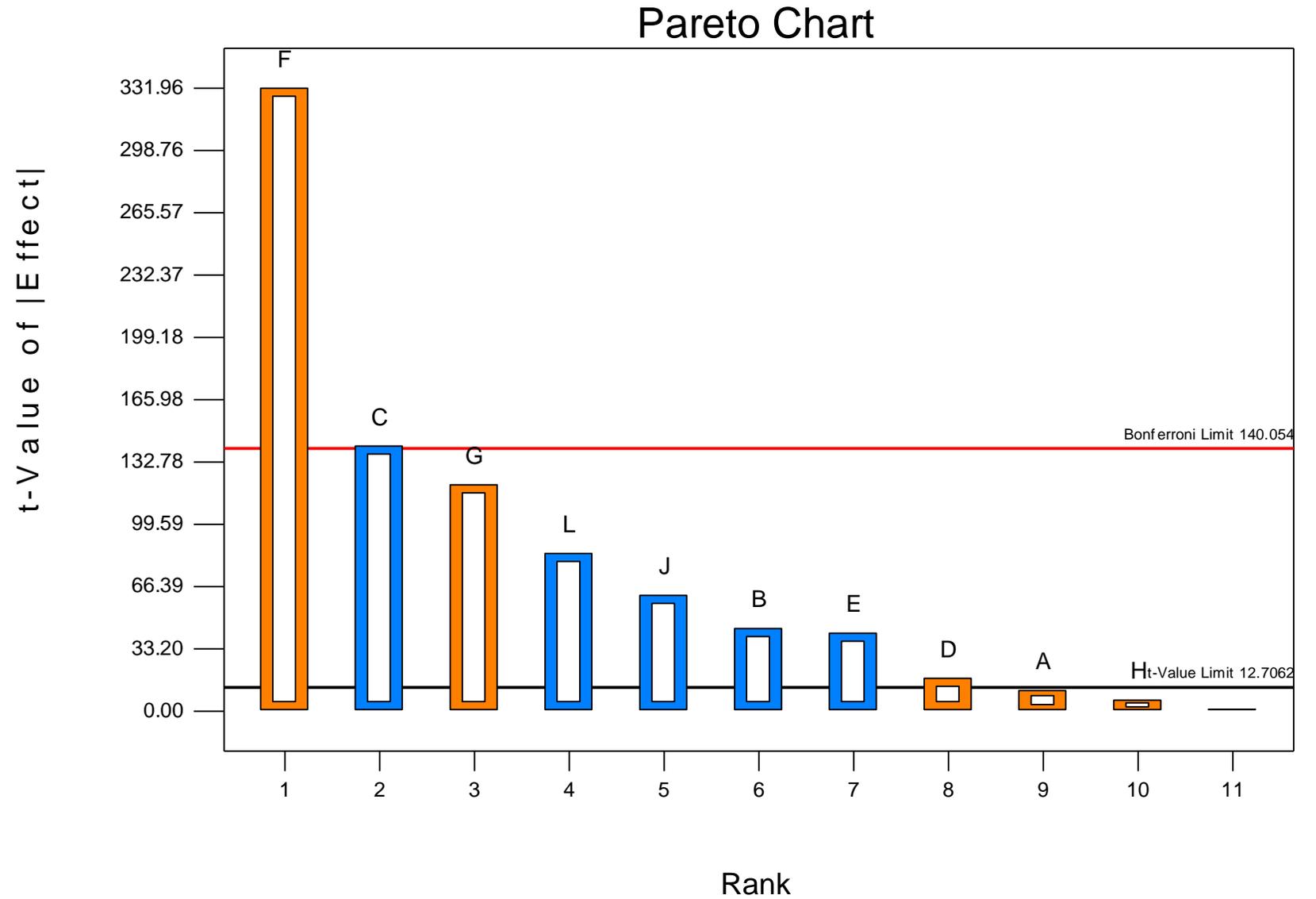


Fig S13: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0B16038g in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

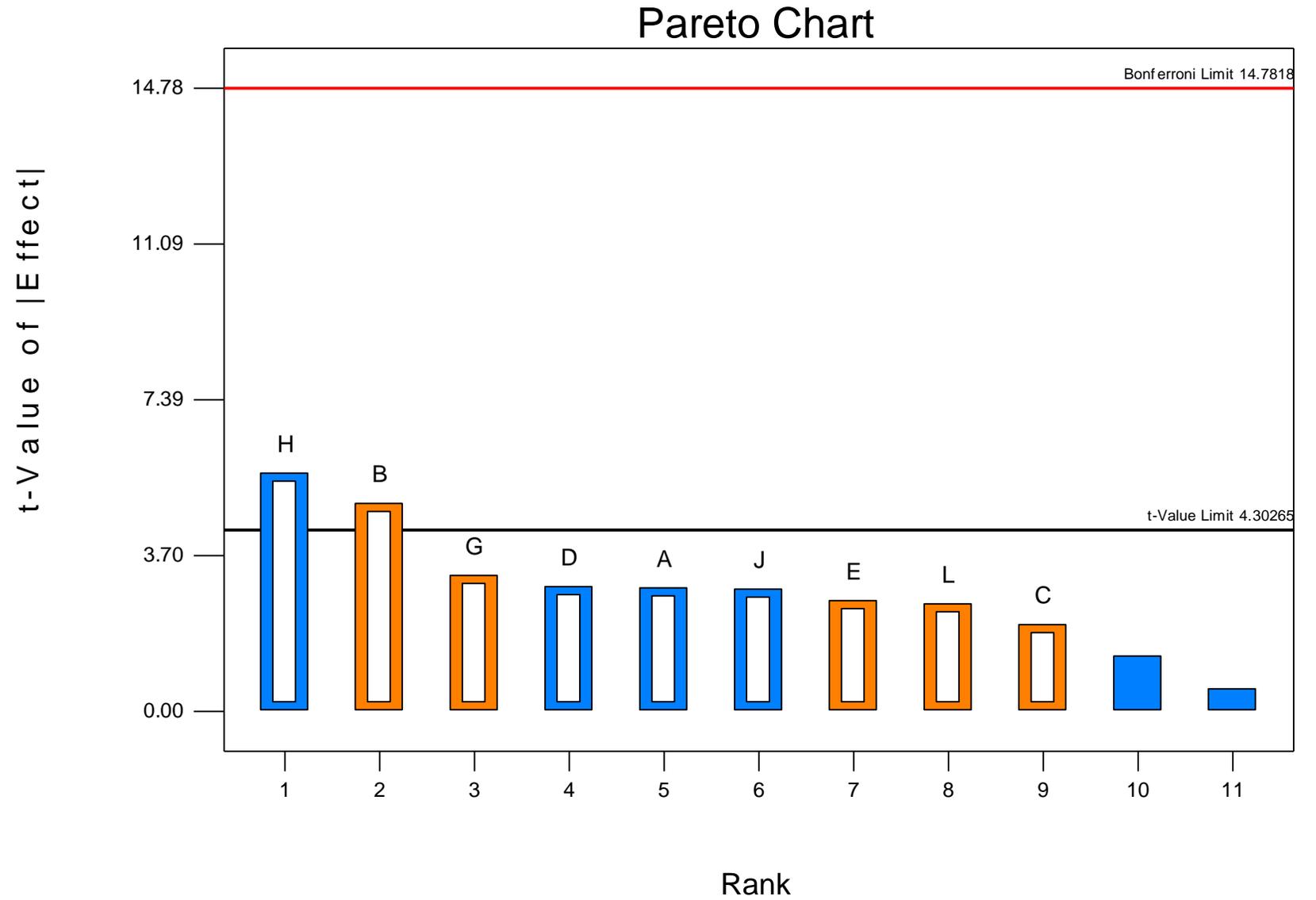


Fig S14: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0B16126g in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

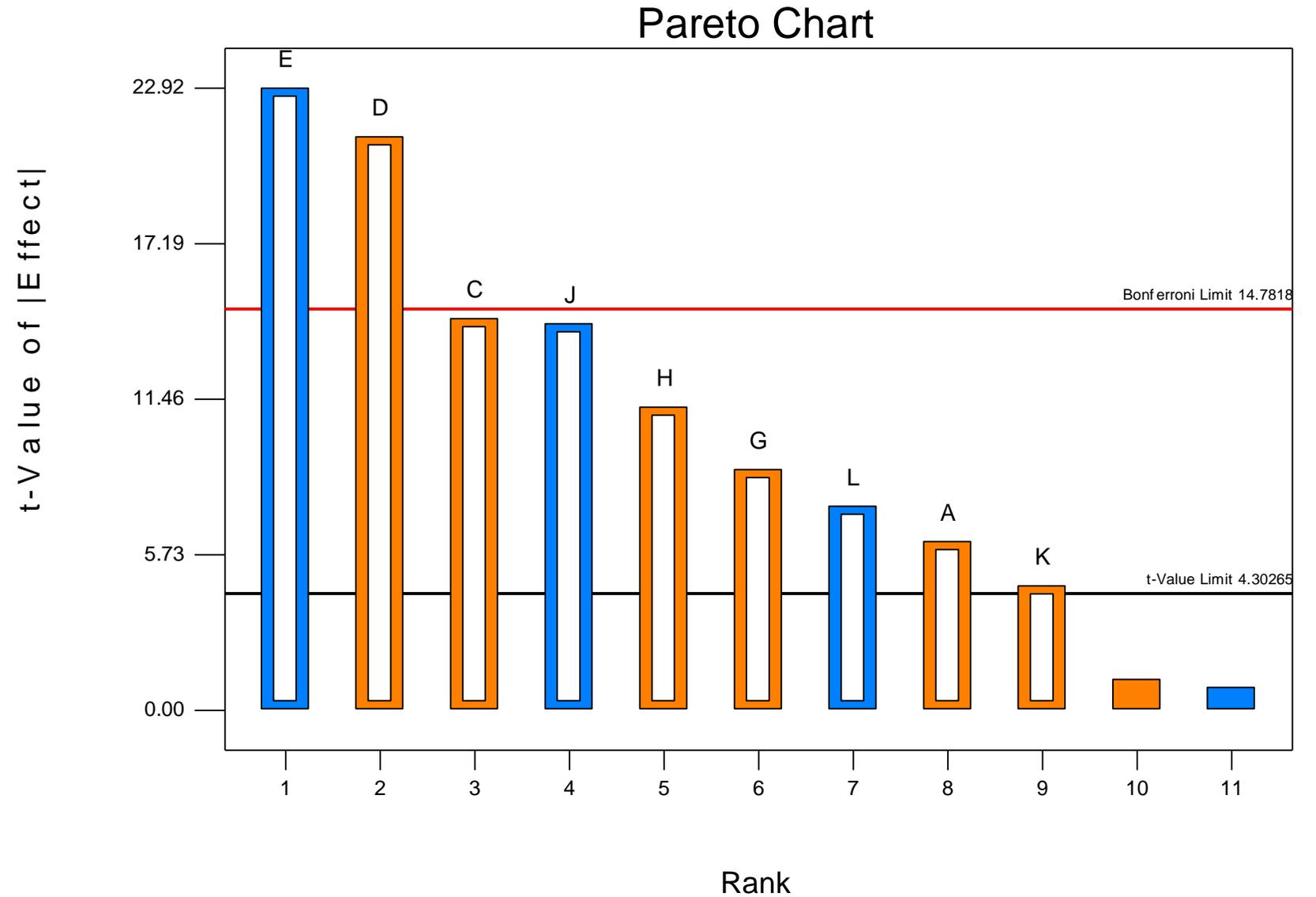


Fig S15: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0C18755g in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

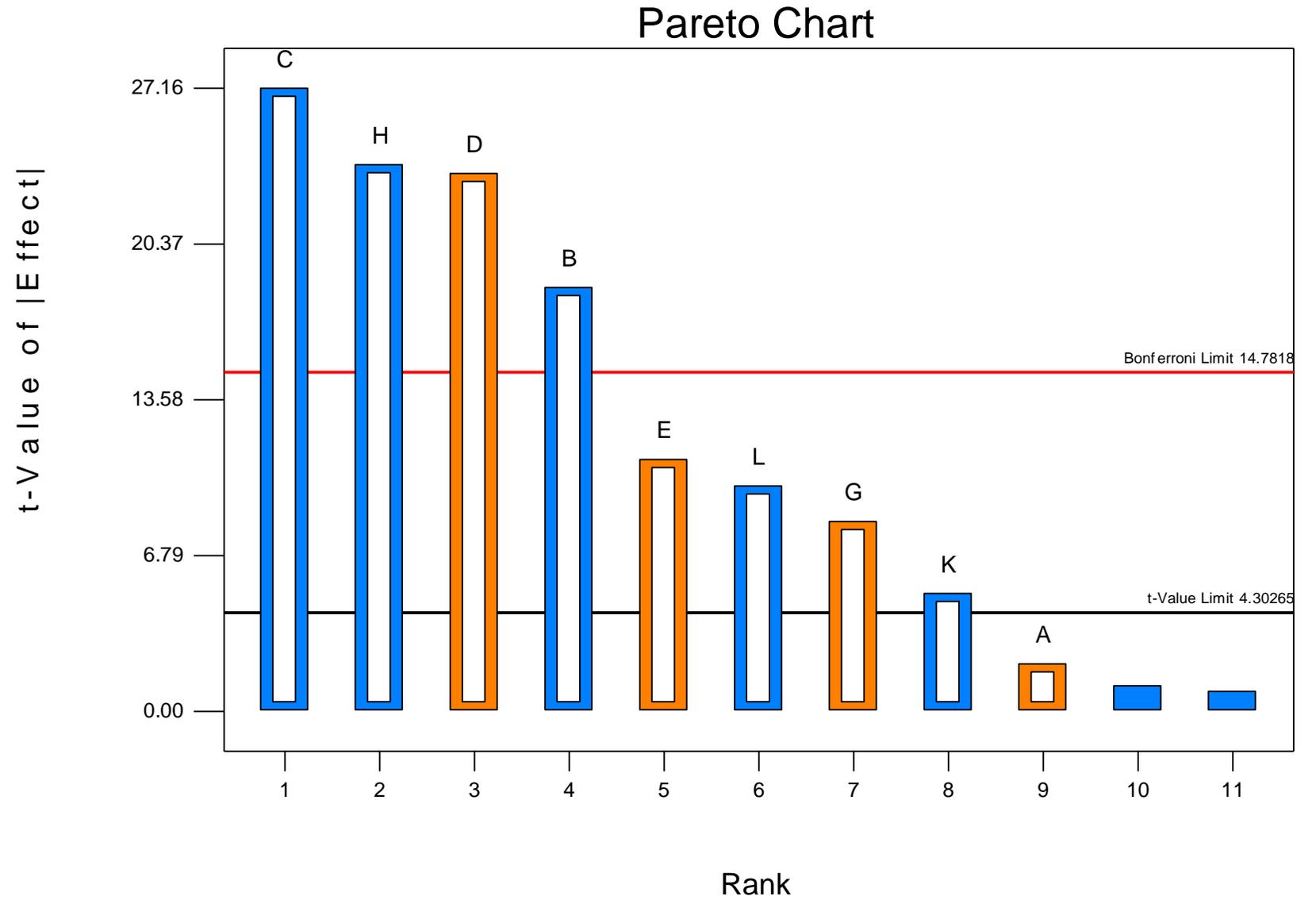


Fig S16: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0C18799g in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

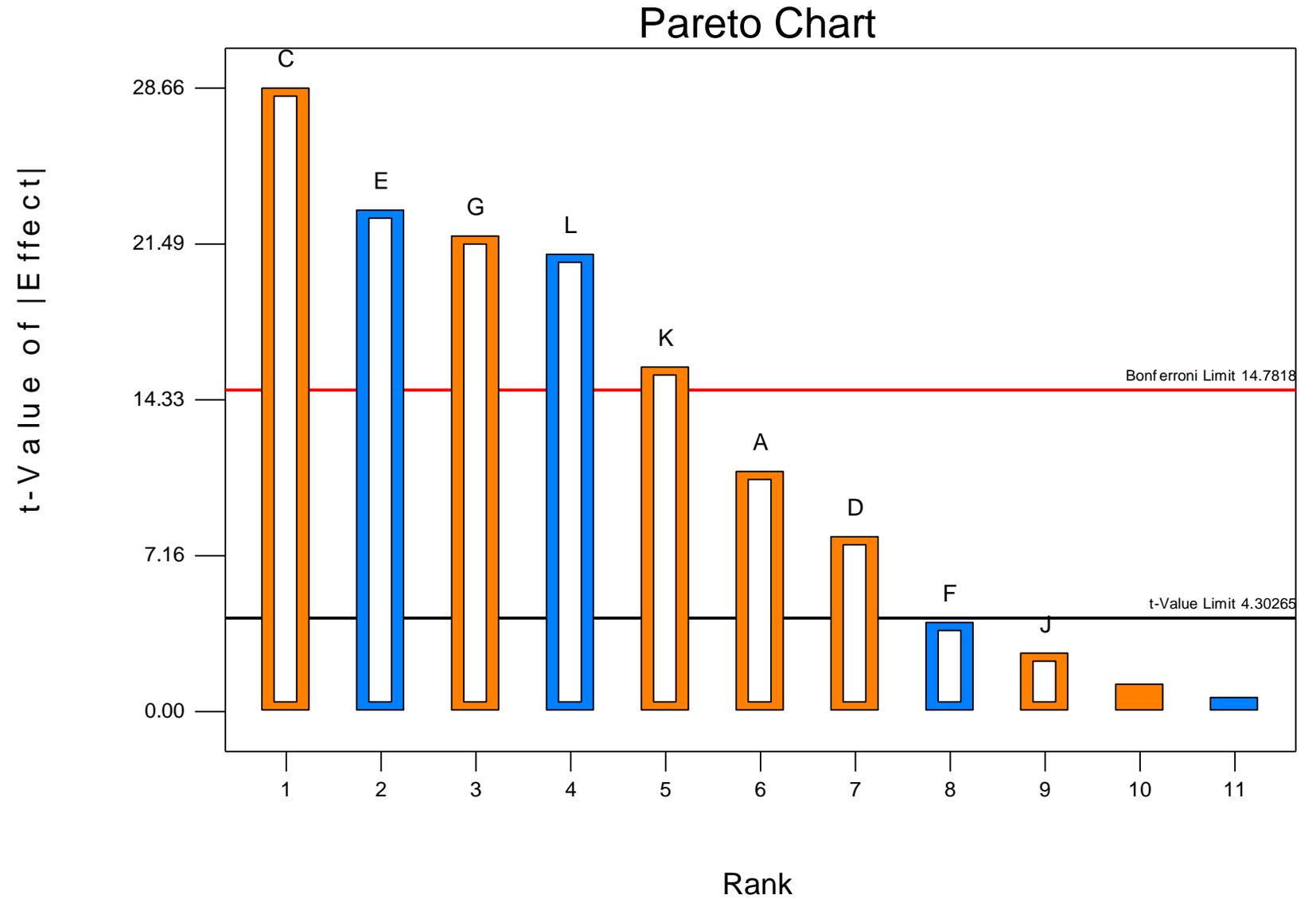


Fig S17: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0D14762g in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

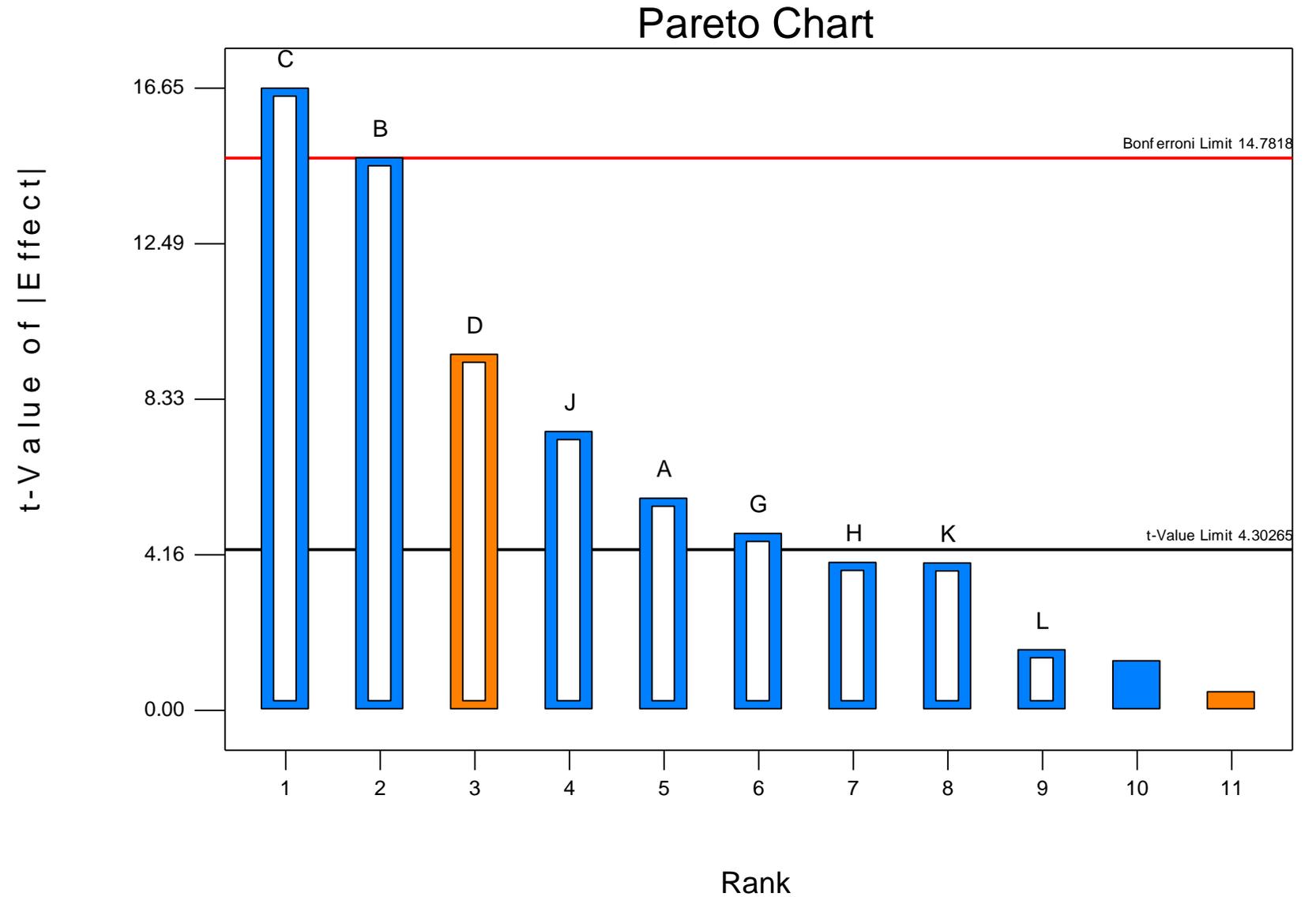


Fig S18: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0D17050g in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

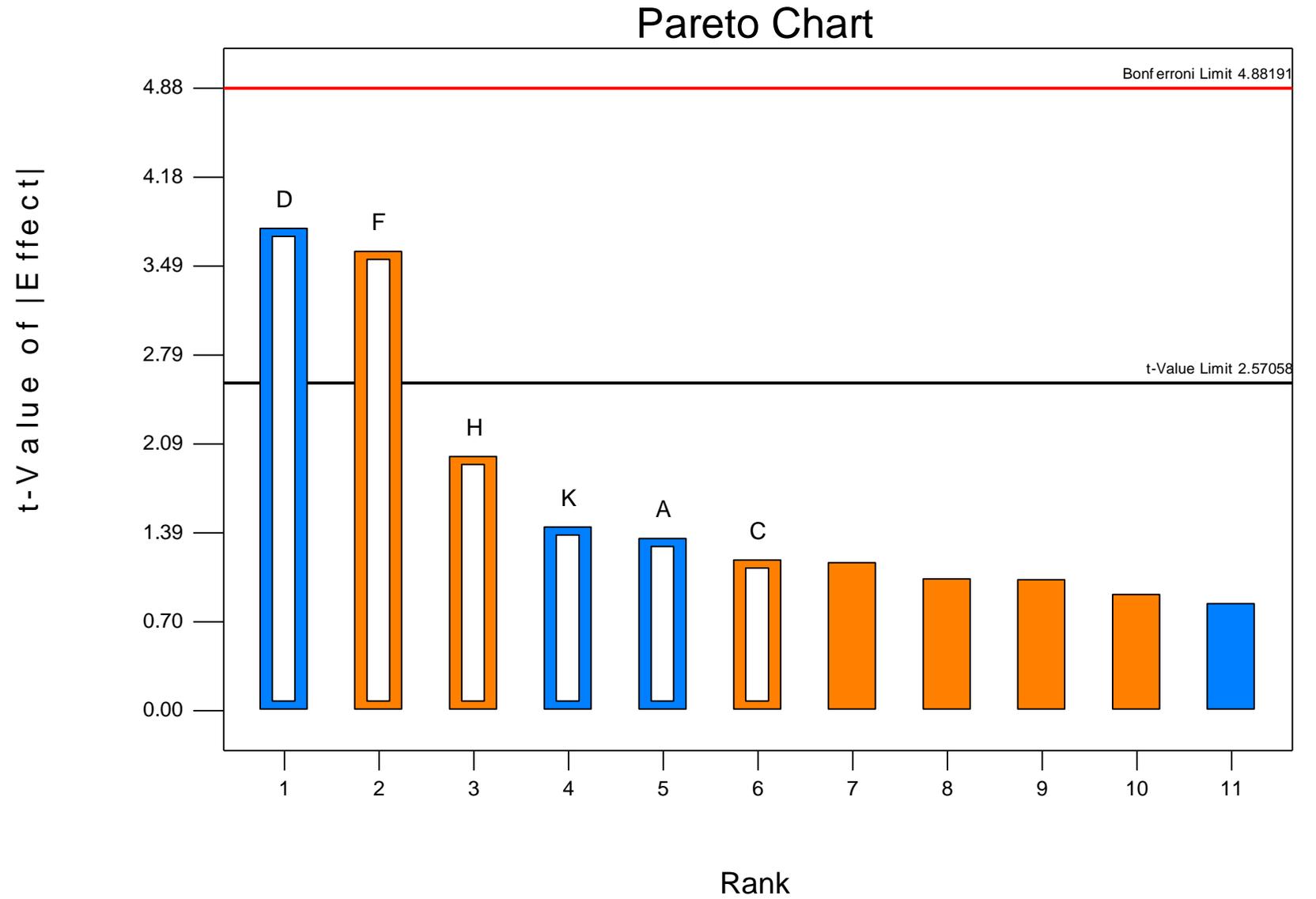


Fig S19: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0D17556g in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

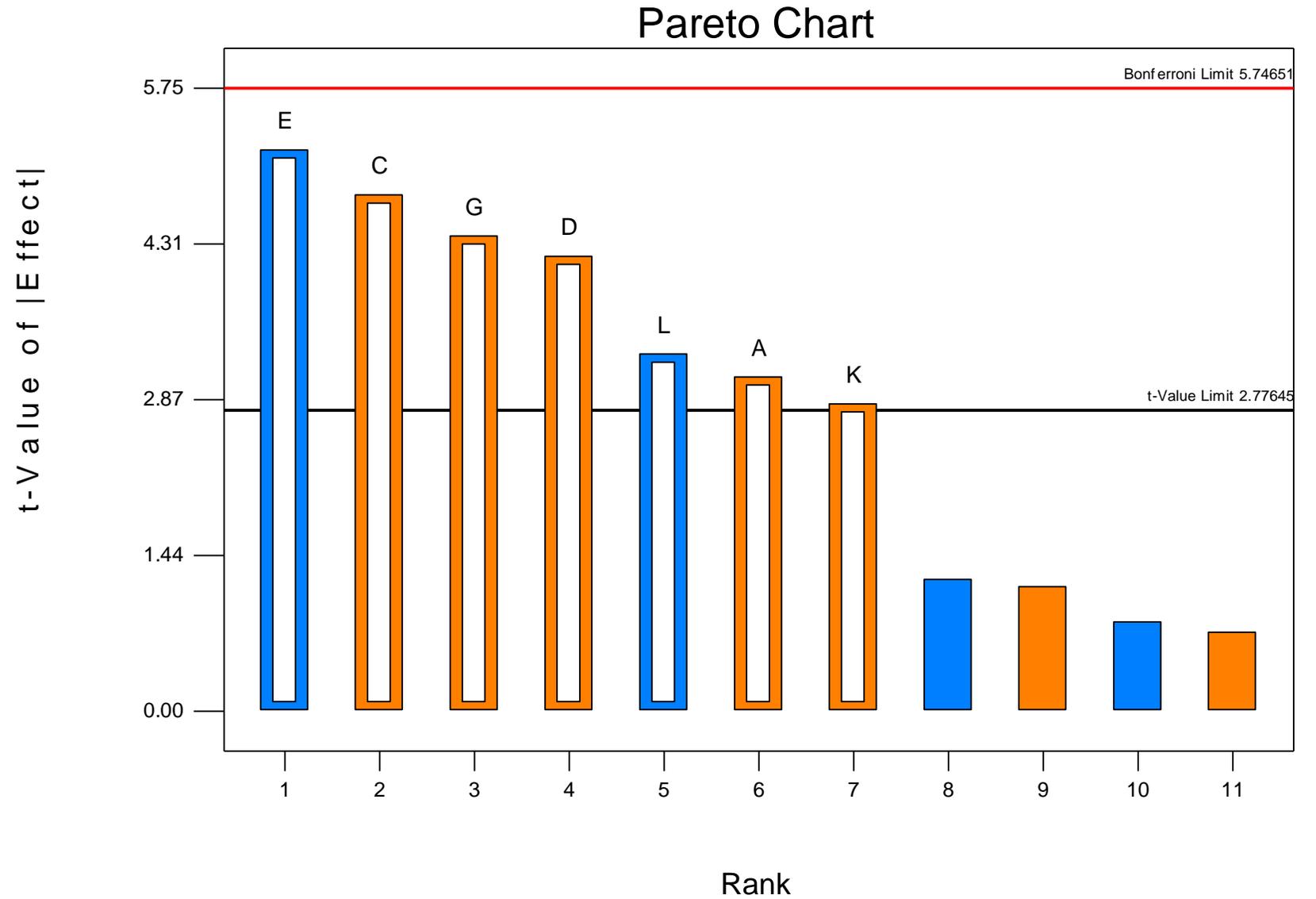


Fig S20: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0E04807g in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

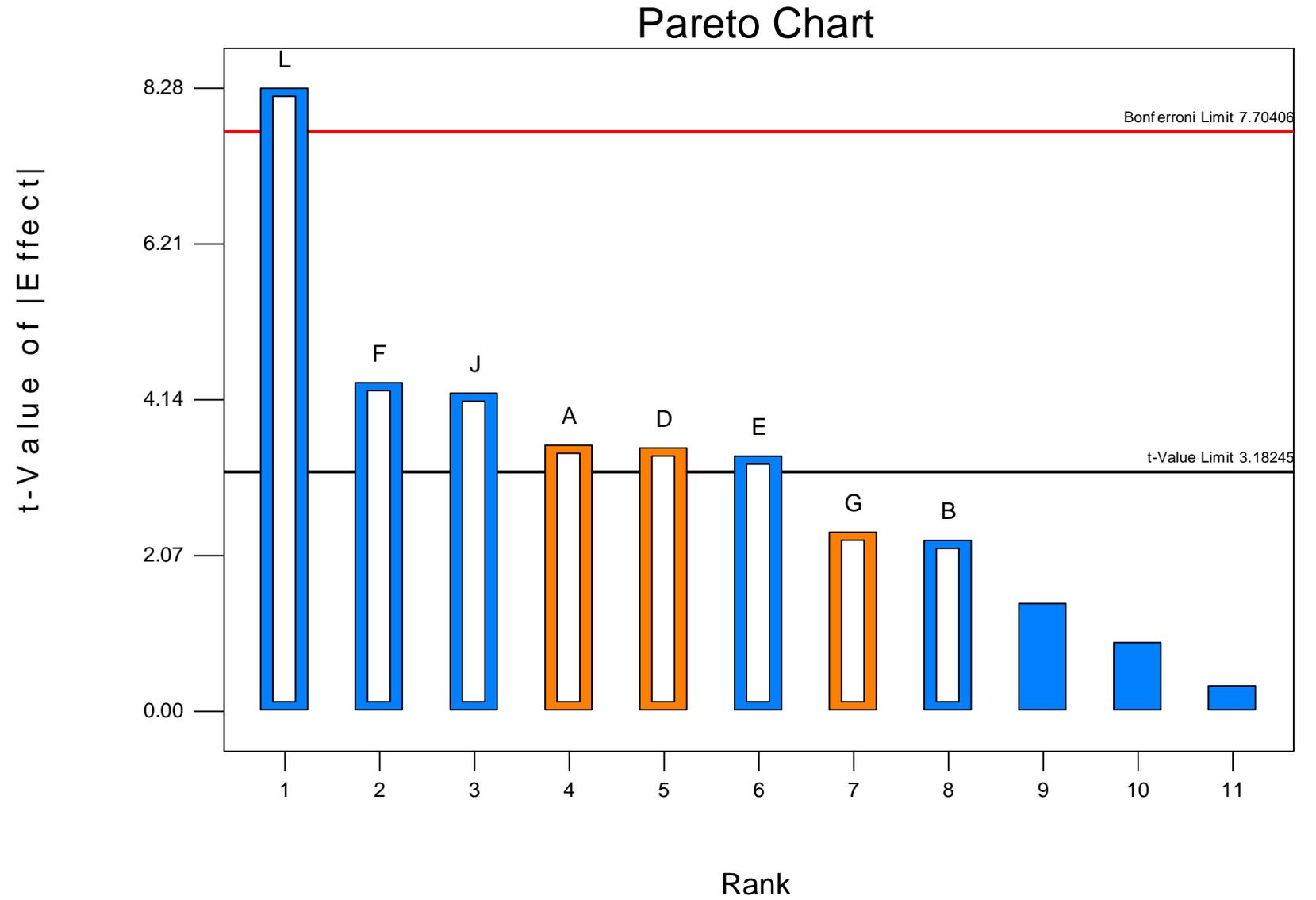


Fig S21: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0E05753g in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

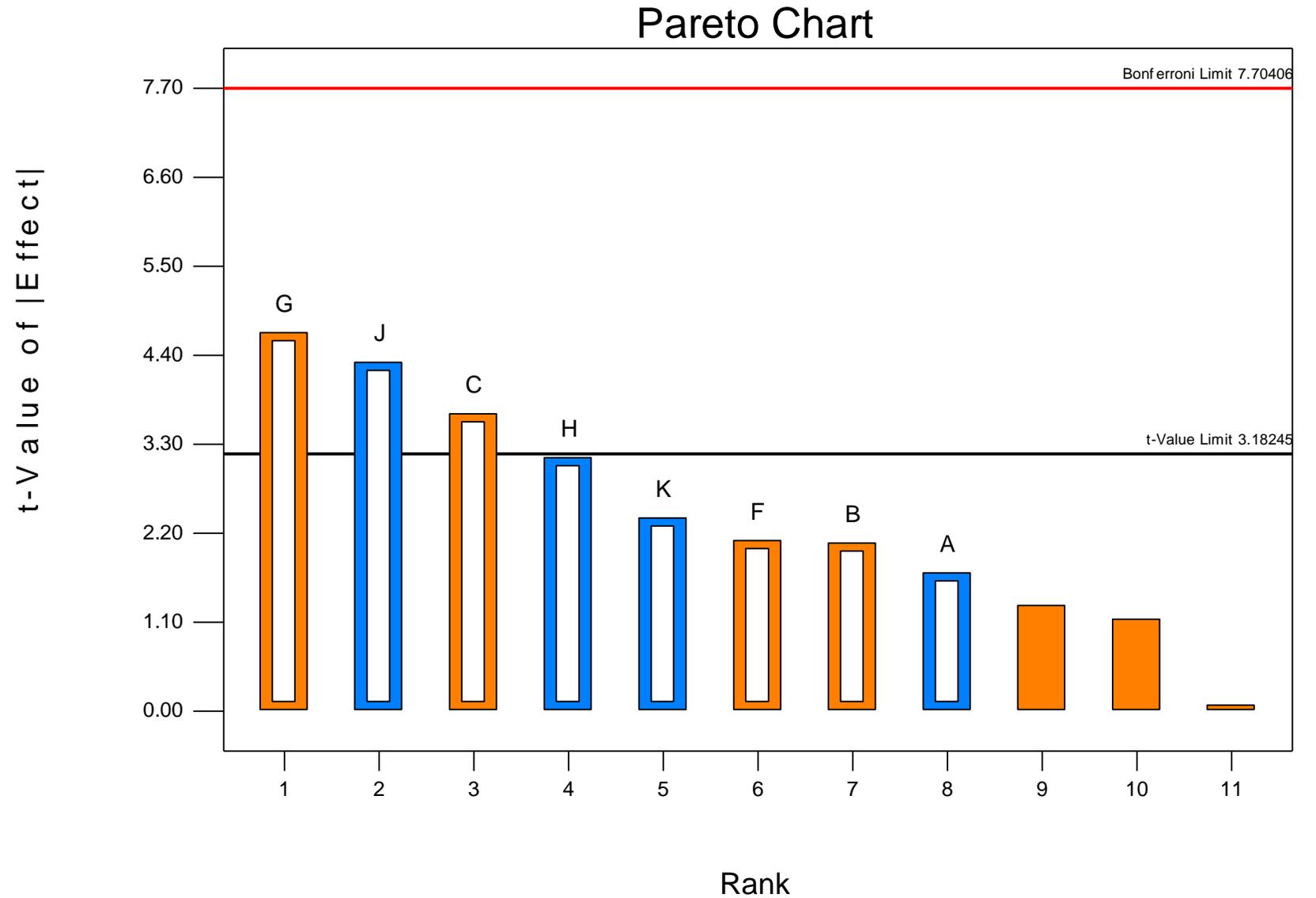


Fig S22: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0E06193g in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

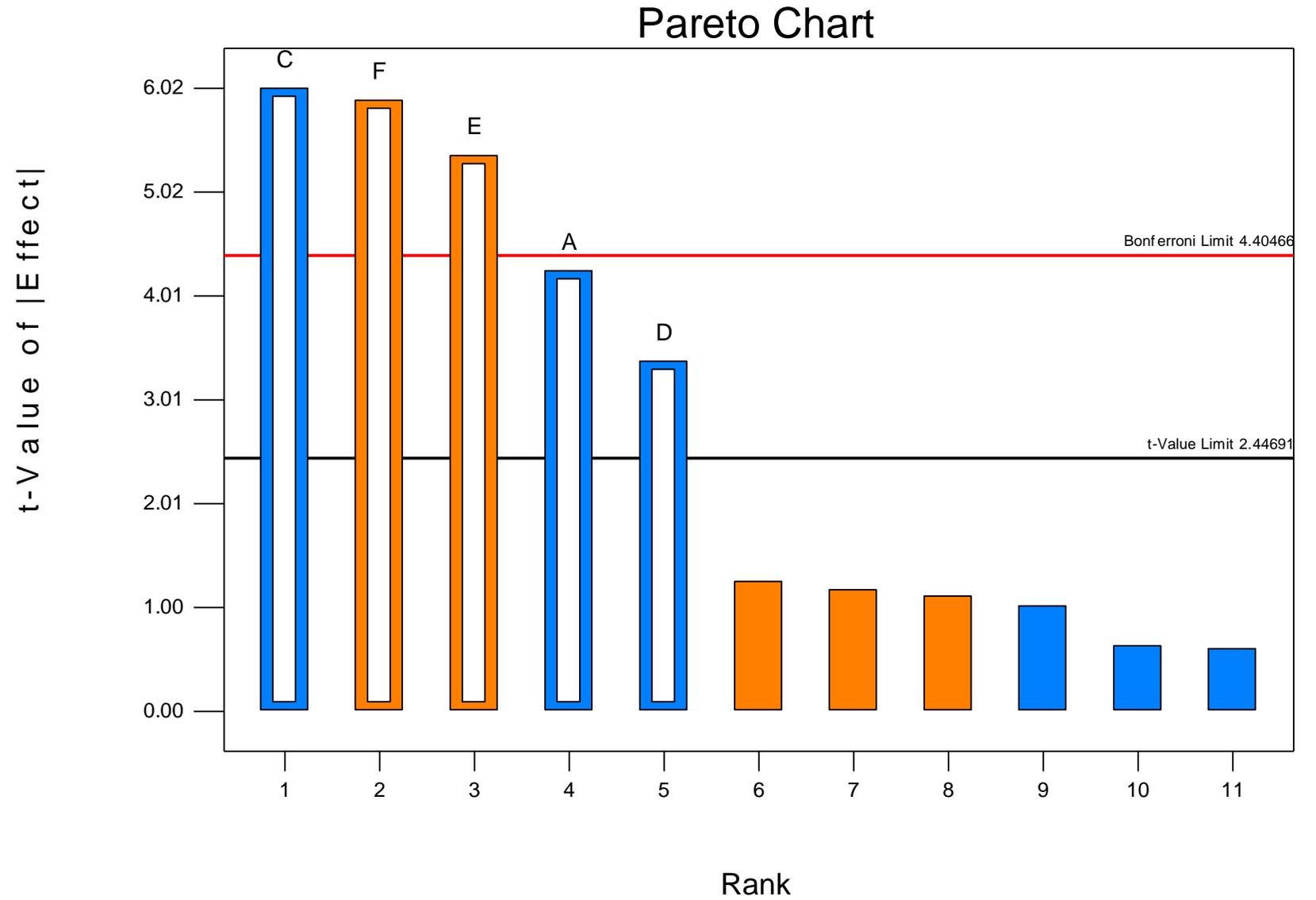


Fig S23: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0E11099g in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

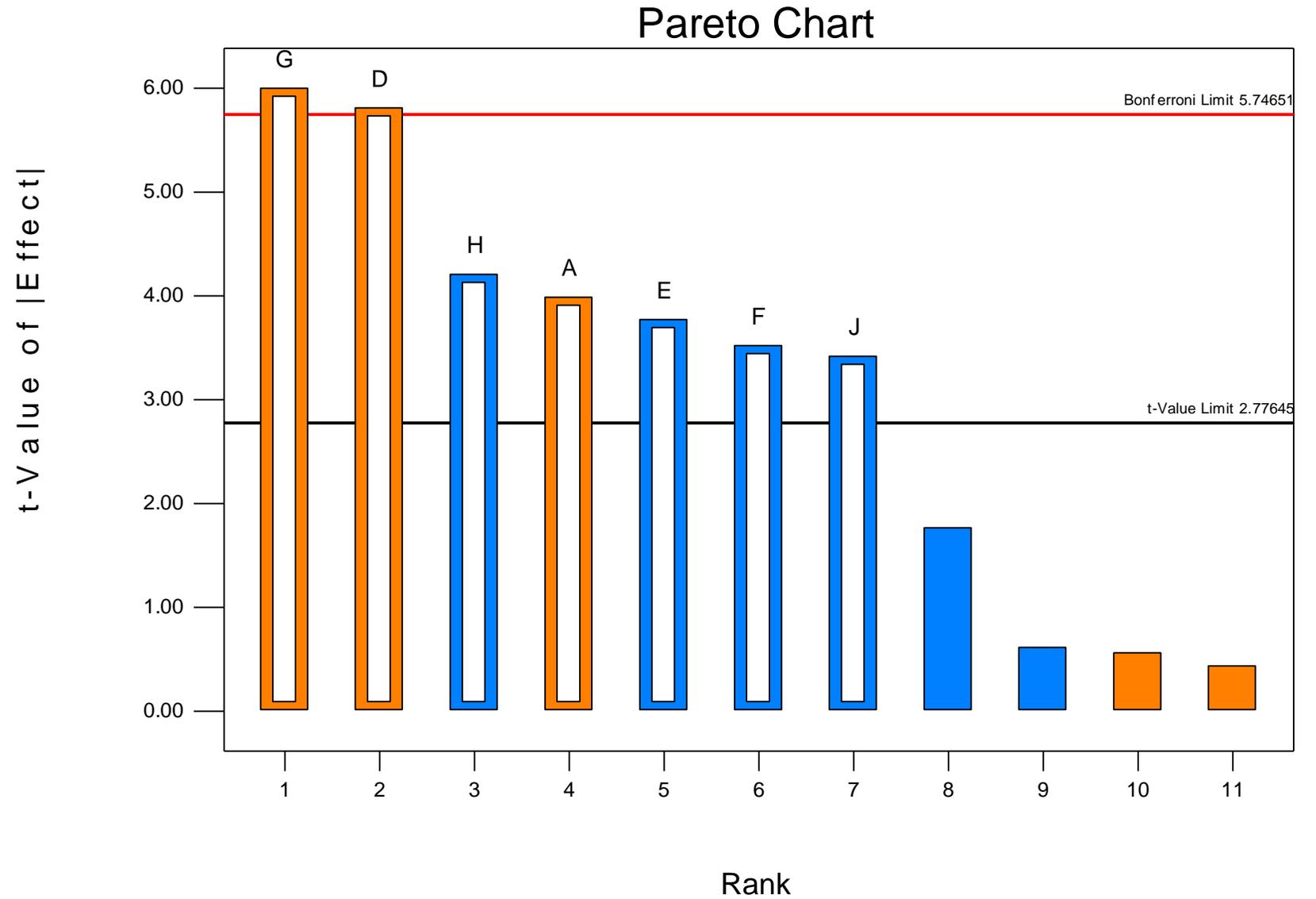


Fig S24: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0F04015g in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

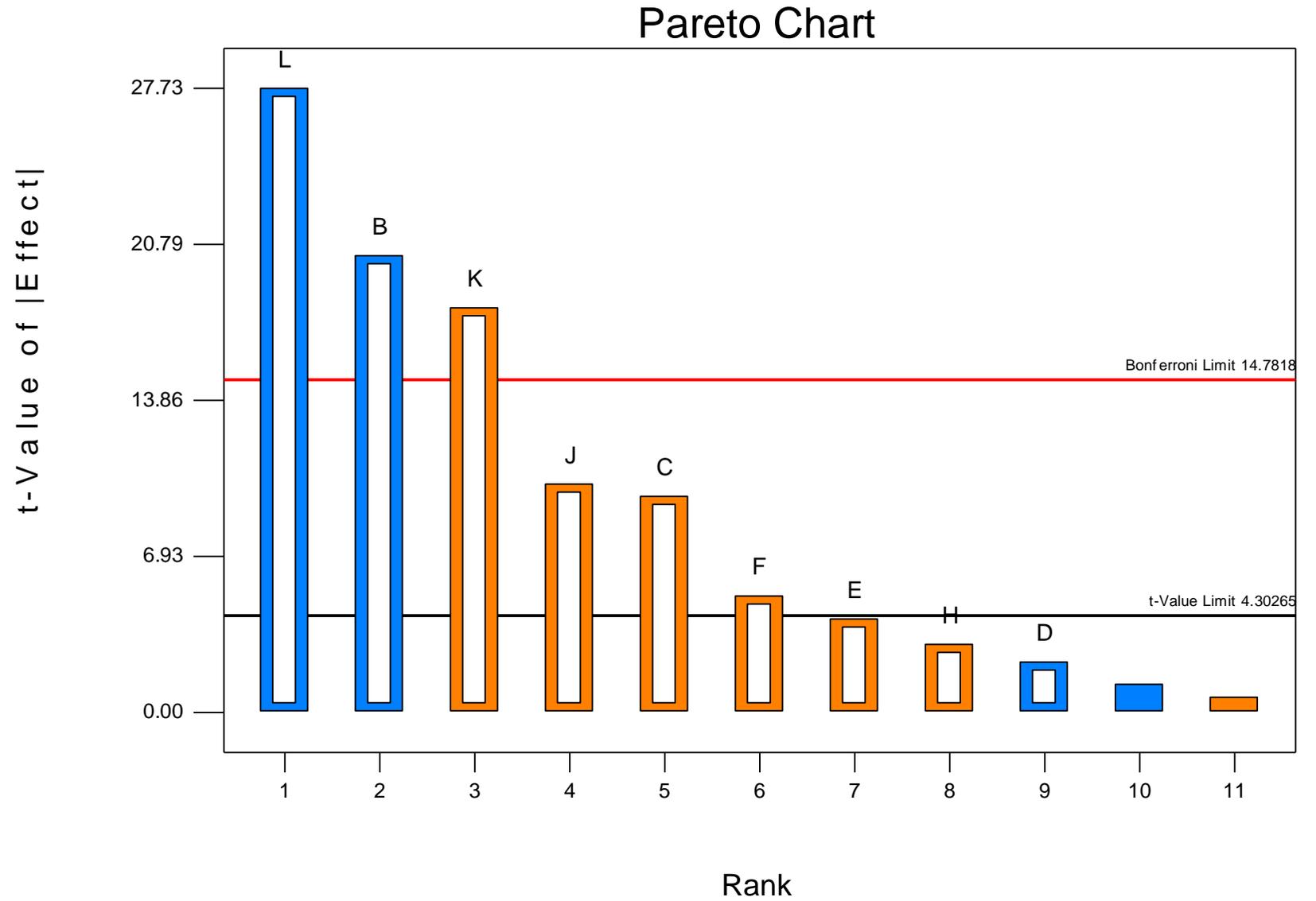


Fig S25: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0F05632g the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

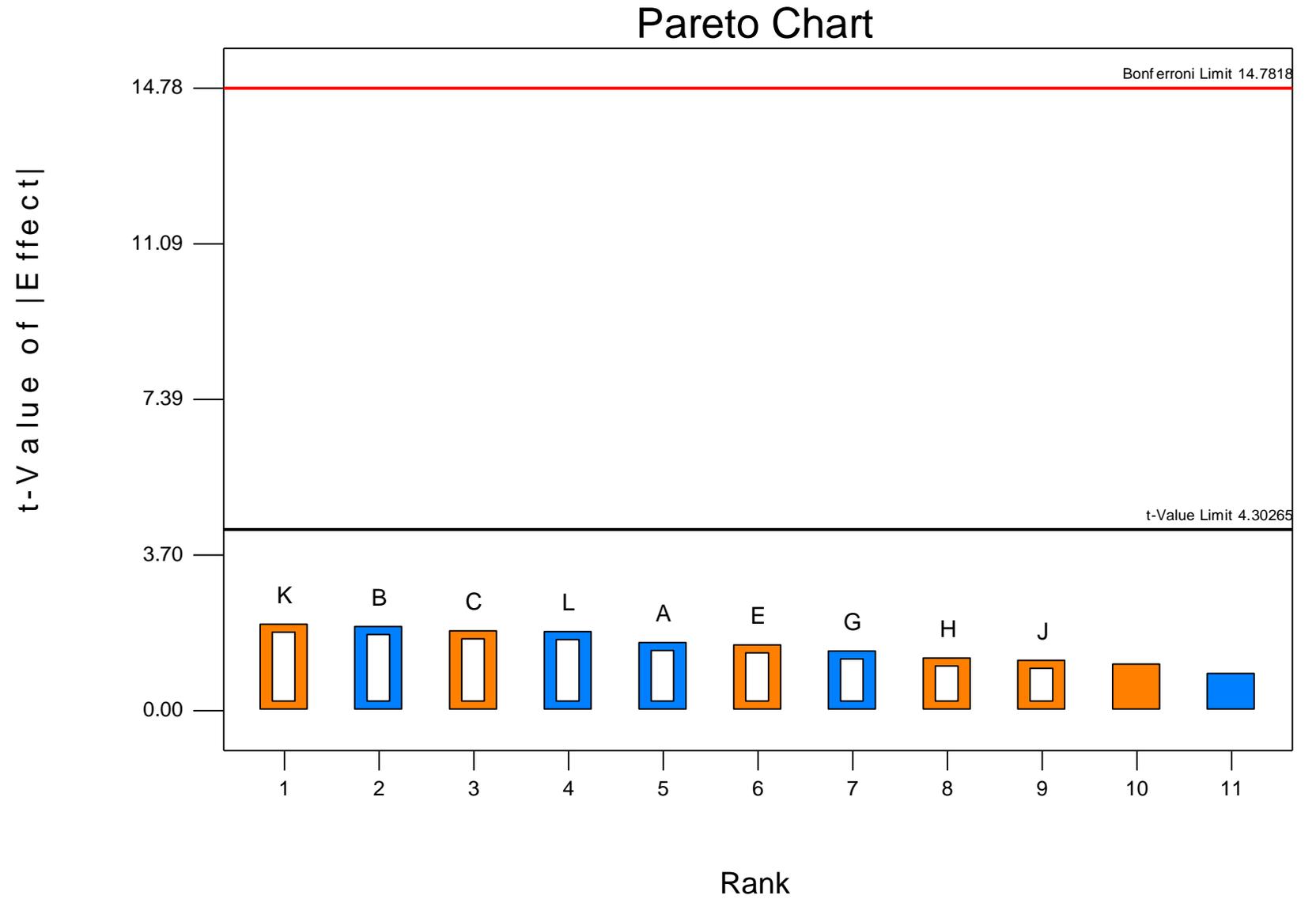


Fig S26: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of YALI0F30481g in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

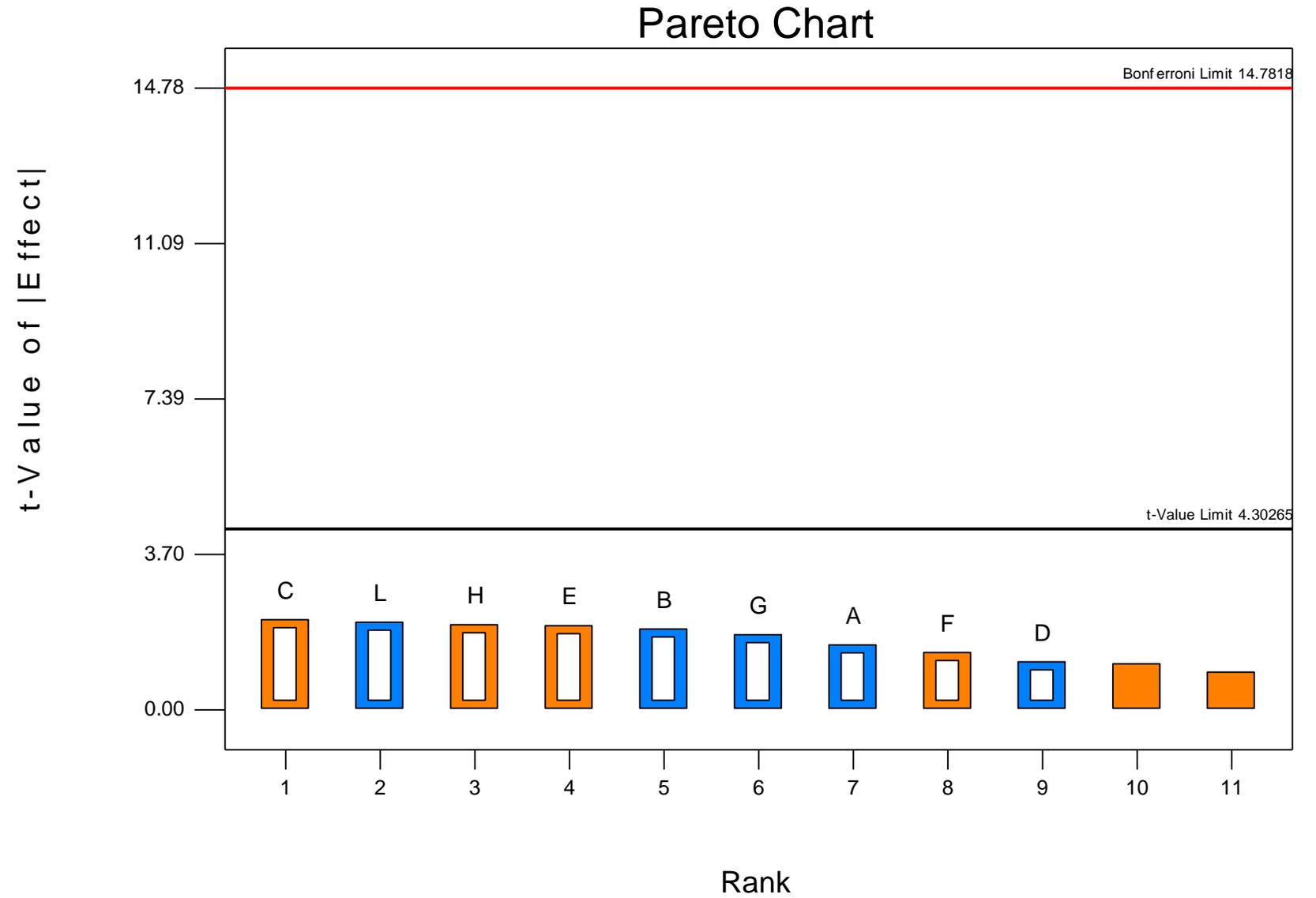


Fig S27: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of zwf in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

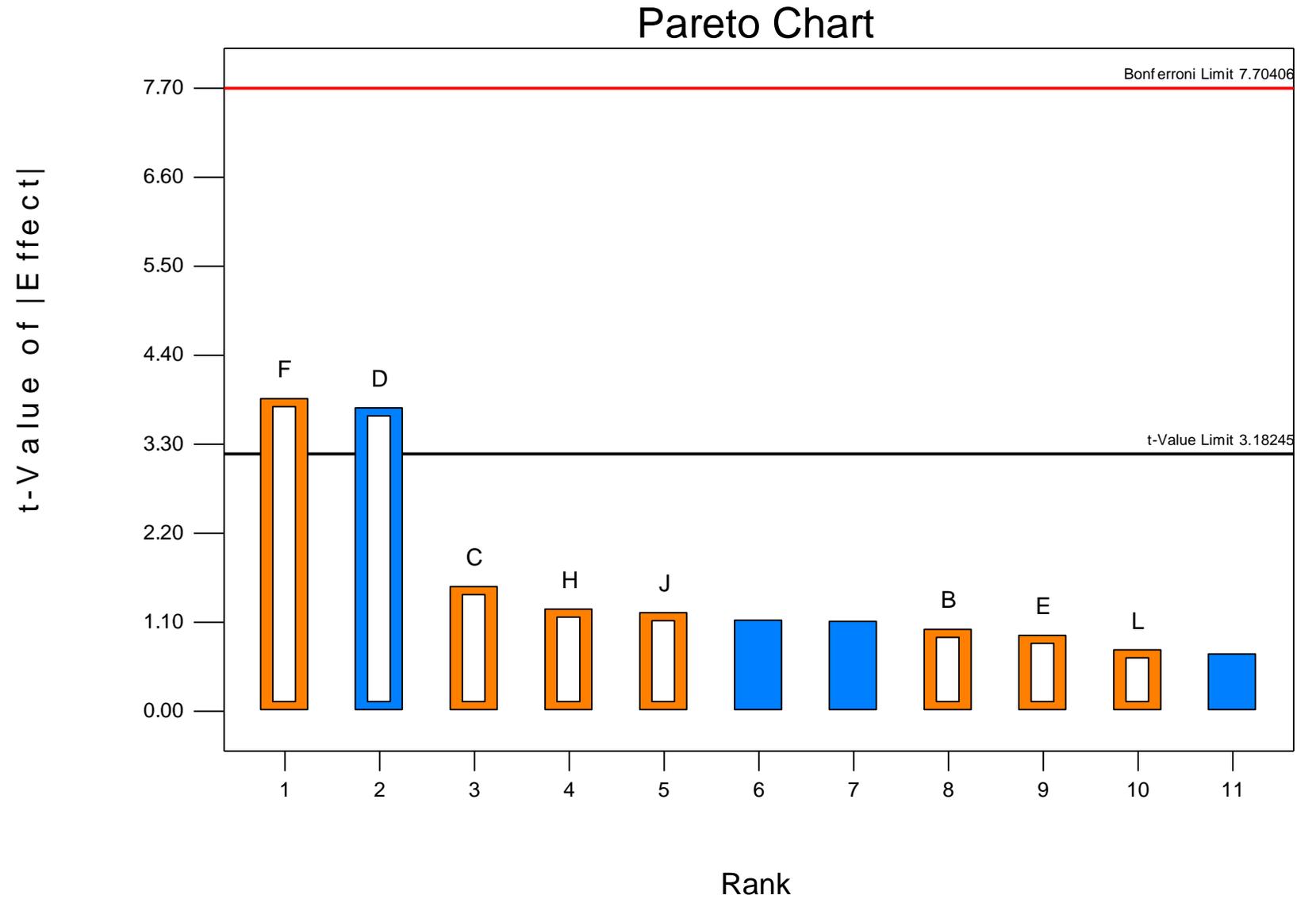


Fig S28: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of crtE in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

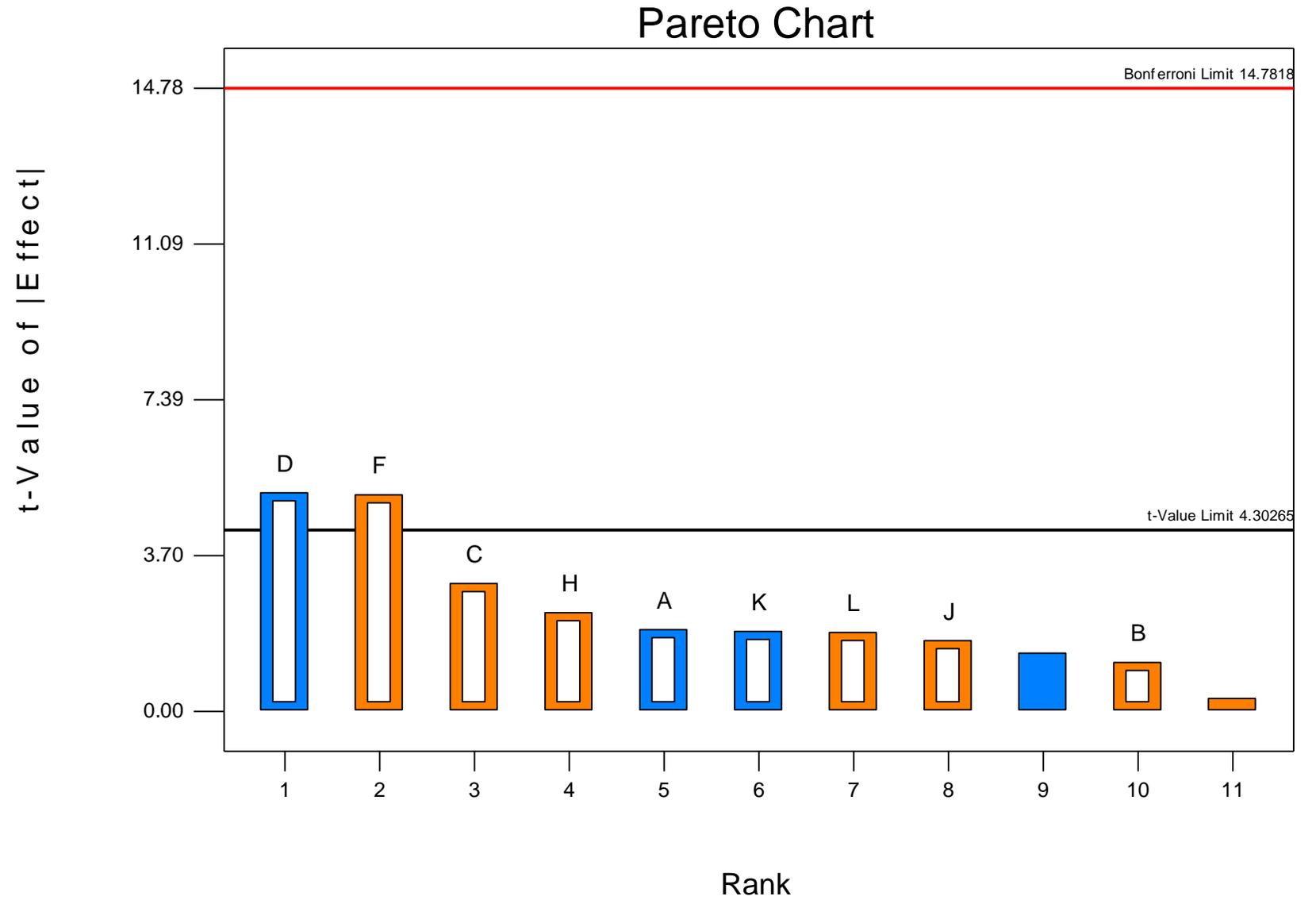


Fig S29: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of crtB in the engineered strain Po1f-1312E+1269IB in the second tour PBD

- A: KH₂PO₄
- B: (NH₄)₂SO₄
- C: L Lysine
- D: L Tryptophan
- E: Ergosterol
- F: Ethanolamine
- G: L Asparagine
- H: L isoleucine
- J: D glucose
- K: D Fructose
- L: Thiamine
- Positive Effects
- Negative Effects

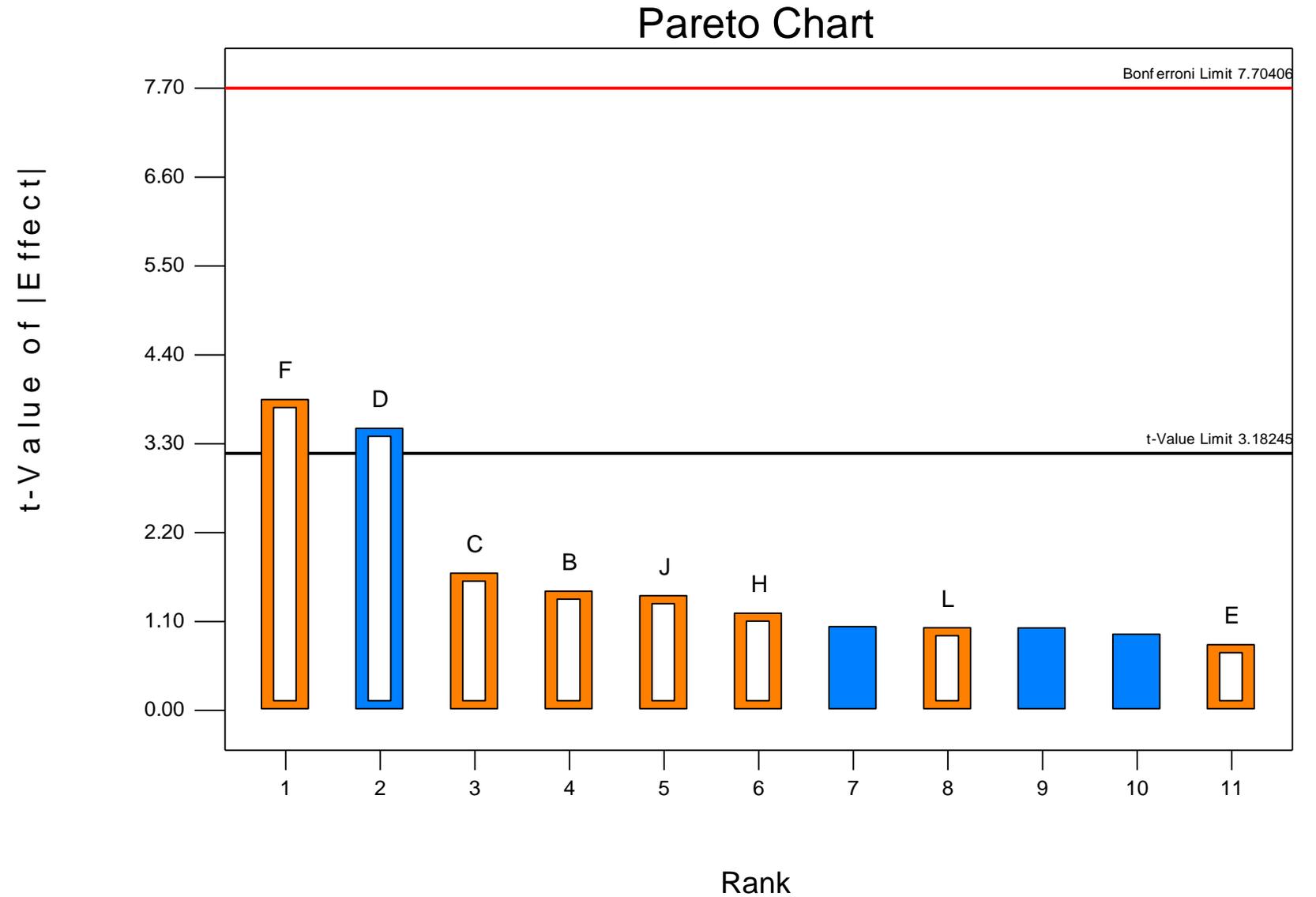


Fig S30: Pareto chart of the effects of chemical compounds predicted by flux balance analysis (FBA) on the expression level of crtI in the engineered strain Po1f-1312E+1269IB in the second tour PBD