**Bayesian Network Structure**

**Root Nodes**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Node Name** | **Node Type** | **Distribution Type** | **Possible Values / Range** | **Direct Parents** | **Direct Children** |
| **API and Excipient** | Root | Categorical | Formulation A / B / C | — | Granule Size, Assay |
| **Milling Settings** | Root | Categorical | Fast / Slow | — | Granule Size |
| **Blending Settings** | Root | Categorical | Time: Short / Long  Speed: Low / High | — | Blend Uniformity |
| **Granulation Parameters** | Root | Categorical | Low / Medium / High | — | Granule Size |
| **Drying Parameters** | Root | Categorical | Temp: Low/High,  Time: Short/Long | — | Moisture Content (Intermediate) |
| **Compression Settings** | Root | Categorical | Low / Medium / High Force | — | Tablet Hardness, Tablet Weight Variation |
| **Coating Parameters** | Root | Categorical | Thin / Medium / Thick | — | Dissolution Rate |
| |  | | --- | | **Packaging Humidity** | | |  | | --- | | Root | | |  | | --- | | Categorical | | |  | | --- | | Low / Medium / High | | |  | | --- | | — | | |  | | --- | | Dissolution Rate | |

**Latent(Intermediate) Nodes**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Node Name** | **Node Type** | **Distribution Type** | **Possible Values / Range** | **Direct Parents** | **Direct Children** |
| **Granule Size** | Latent | ConditionalCategorical | Fine / Medium / Coarse | API and Excipient, Milling Settings, Granulation Parameters | Powder Floability, Tablet Hardness, Dissolution Rate |
| **Blend Uniformity** | Latent | ConditionalCategorical | Low / Medium / High | Blending Settings | Content Uniformity |
| **Moisture Content (Interm.)** | Latent | ConditionalCategorical | Low / Medium / High | Drying Parameters | Dissolution Rate |
| **Powder Floability** | Latent | ConditionalCategorical | Poor / Good | Granule Size | Tablet Weight Variation |

**Leafe Nodes**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Node Name** | **Node Type** | **Distribution Type** | **Possible Values / Range** | **Direct Parents** | **Direct Children** |
| **Assay** | Leaf | ConditionalCategorical | Low / Acceptable / High | API and Excipient | — |
| **Content Uniformity** | Leaf | ConditionalCategorical | Low / Medium / High | Blend Uniformity | — |
| **Tablet Hardness** | Leaf | ConditionalCategorical | Low / Medium / High | Granule Size, Compression Settings | — |
| **Dissolution Rate** | Leaf | ConditionalCategorical | Slow / Acceptable / Fast | Granule Size, Moisture Content, Coating Parameters, Packaging Humidity | — |
| **Tablet Weight Variation** | Leaf | ConditionalCategorical | Low / Medium / High | Compression Settings, Powder Floability | — |

| **Node** | **Type** | **Distribution Type** | **Possible Values / Range** | **Direct Parents** | **Direct Children** |
| --- | --- | --- | --- | --- | --- |
| **API and Excipient** | Root | Categorical | API Type A/B, Excipient Type X/Y | – | Granule Size |
| **Milling Settings** | Root | Categorical | Low / Medium / High | – | Granule Size |
| **Blending Settings** | Root | Categorical | Short / Optimal / Long | – | Blend Uniformity |
| **Granulation Parameters** | Root | Categorical | Low / Optimal / High | – | Granule Size |
| **Drying Parameters** | Root | Categorical | Under / Optimal / Over | – | Moisture Content (Intermediate) |
| **Compression Settings** | Root | Categorical | Low / Optimal / High | – | Tablet Hardness, Tablet Weight Variation |
| **Coating Parameters** | Root | Categorical | Thin / Optimal / Thick | – | Dissolution Rate |
| **Packaging Humidity** | Root | Categorical | Low / Optimal / High | – | Dissolution Rate |
| **Granule Size** | Latent | Conditional Categorical | Fine / Medium / Coarse | API and Excipient, Milling, Granulation | Powder Floability, Tablet Hardness, Dissolution Rate |
| **Blend Uniformity** | Latent | Conditional Categorical | Poor / Acceptable / Excellent | Blending Settings | Content Uniformity |
| **Moisture Content (Interm)** | Latent | Conditional Categorical | Low / Optimal / High | Drying Parameters | Powder Floability, Dissolution Rate |
| **Powder Floability** | Latent | Conditional Categorical | Poor / Moderate / Good | Granule Size, Moisture Content | Tablet Weight Variation |
| **Tablet Weight Variation** | Leaf | Conditional Categorical | Low / Medium / High | Compression Settings, Powder Floability | – |
| **Tablet Hardness** | Leaf | Conditional Categorical | Soft / Ideal / Hard | Granule Size, Compression Settings | – |
| **Dissolution Rate** | Leaf | Conditional Categorical | Slow / Medium / Fast | Granule Size, Moisture Content, Coating, Packaging Humidity | – |
| **Content Uniformity** | Leaf | Conditional Categorical | Low / Medium / High | Blend Uniformity | – |
| **Assay** | Leaf | Conditional Categorical | Below / Within / Above Spec | API and Excipient | – |