Short answer type questions

Q1. Why gluten polypeptides are termed as prolamins?

Ans. Gluten polypeptides are called prolamins because they are rich in proline and glutamine amino acid residues and are extractable (either partially/ completely) in aqueous alcohol.

Q2. What is the role of glaidin and glutenin?

Ans. Gliadin and glutenin are known to impart entirely different physical properties to the gluten network in dough. Gliadin behaves mainly as a viscous liquid when hydrated and imparts extensibility, allowing the dough to rise during fermentation, whereas glutenin provides elasticity and strength, preventing the dough from being over-extended and collapsing either during fermentation or in baking.

Q3. What is the importance of total number and relative position of cysteine residues on the gluten polypeptides?

Ans. Total numbers and relative positions of cysteine residues are important for polymer size and the different polymerisation behavior of gliadins and glutenin subunits. The presence of cysteine residues in the form of intramolecular disulphide bonds in gliadins and inter- and intramolecular disulphide bonds in glutenin subunits is due to the fact that gliadins have even numbers of cysteine residues whereas glutenin subunits have odd number of residues within a single structural domain. It is the intermolecular disulphide linkages which are considered responsible for gaint size of glutenin polymer.

Q4. What is the importance of disulphide linkages in dough development?

Ans: Disulfide bonds play a key role in the formation and development of dough. They form strong cross-links within and between polypeptide chains, thereby stabilizing hydrogen bonds and hydrophobic interactions. During dough formation and development, disulfide bonds can be mobilized through disulfide-interchange reactions. The interchange reaction requires a mobile (soluble or low-molecular-weight) sulfhydryl-containing substance to initiate the series of disulfide interchanges resulting in extensive polymerization of gluten proteins.

Q5. What is the importance of hydrogen bonding?

Ans: Hydrogen bonds act cooperatively and contribute significantly to the structure of the dough. They have ability to interchange under stress and thereby facilitate re-orientation of gluten proteins.

Q6. Wheat gluten proteins have very low charge density. How this property of gluten proteins important to end-use quality of bakery products?

Ans. The low charge density is due to their low level of basic amino acids, such as lysine, histidine, arginine and tryptophan, and also due to the fact that glutamic and aspartic acids occur mainly as amides. A consequence of this low charge density, the wheat gluten proteins are not repelled by mutual charge repulsion and associate strongly by non-covalent interactions. Such behaviour is important to baking technology as it results in the formation of viscoelastic gluten network that is essential for gas retention.

Q7. What is linear glutenin hypothesis?

Ans: The “linear glutenin hypothesis” was proposed by Ewart so as to explain the viscoelasticity of gluten. According to Ewart, the glutenin polypeptide chains form long linear concatenations with two S-S bonds connecting each chain in a head to tail

fashion to the next chain. Under stress conditions, the entangled and non-covalently cross linked structure in glutenin offers resistance to deformation. Whereas viscous flow depends predominantly on molecular slippage at nodes and liable nature of weak secondary forces acting between glutenin polymers.

Q8. What are the different types of prolamins?

Ans: The different type of prolamins are gliadins and glutenins in wheat, hordeins in barley, secalins in rye, avenins in oats, zein in maize, oryzins in rice and kafirins in millet and sorghum.

Q9. What are LMW prolamins?

Ans: The LMW group (sulphur rich prolamines) contains monomeric proteins including α/β and γ-gliadins, γ-40k-secalins, γ-hordeins, and avenins. Their sequences consist of approximately 300 amino acid residues corresponding to molecular weights of around 28,000-35,000. The amino acid composition is dominated by glutamine, proline and high contents of hydrophobic amino acids such as leucine and valine.

Q10. What is concatenation?

Ans: The intermolecular sulphur–sulphur bonds connecting a polypeptide chain in a head –to- tail fashion to the next chain, and forming a linear macropolymer of glutenin is known as “concatenations”.

Q11. Why is mixing important during bread making?

Ans: Mixing transforms the flour and water into cohesive viscoelastic dough. Another key function of the mixing operation is the incorporation of air.

Q12. What are the three basic steps of bread making?

Ans: Bread making process is accomplished through three basic operations i.e., mixing, fermentation, and baking.

Q13. What are gluten forming proteins?

Ans: These proteins are classified into two major groups, viz. gliadins and glutenins, based on their extractability and unextractability, respectively, in aqueous alcohol.

Q14. What are gliadins proteins?

Ans: These proteins are usually classified into four main sub-categories, β, α-, γ- and ω-gliadins. These are soluble in aqueous alcohol. They are extensible proteins and are held responsible for viscosity or spread ability of dough.

Q15. What is the Shewry classification of protein?

Ans: Shewry and colleagues divided gluten proteins into three main categories namely: sulphur-poor prolamins, sulphur-rich prolamins and high molecular weight (high M_w) prolamins.